

# CANADIAN MACHINERY

## AND MANUFACTURING NEWS

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Subscription Price

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Canadian machinists recognize the name of Starrett as a guarantee of quality and superiority in tools, tapes and hacksaws.

**THE L. S. STARRETT CO., Athol, Mass.**

*The World's Greatest Toolmakers. Manufacturers of Hack Saws Unexcelled.*

42-158



# Starrett Tools



# STAYBOLT TAPS

## The Better the Man, the More He Appreciates Them—

Not only good when new, but heat treated and seasoned to maintain this goodness. Can be ground on face of cutting edge without affecting their size. That's why you'll find Pratt and Whitney Stay Bolt Taps on the job long after cheaper, "just as good" tools are buried in the scrap pile.

Threads accurately and cleanly cut, with the least expenditure of time and effort, are other reasons why these better Taps are favorites in the shop.

If you've used them before, you know just how good they are. If you haven't, send us your first order—we know you'll be back for more. They're carried in stock in our sales rooms in all large cities.

**PRATT & WHITNEY CO.  
OF CANADA, LIMITED**

*Works: DUNDAS, Ontario*

MONTREAL  
723 Drummond Bldg.  
TORONTO  
1002 C.P.R. Bldg.  
WINNIPEG  
1205 McArthur Bldg.  
WINDSOR  
Davis Building  
HALIFAX  
Roy Building  
VANCOUVER  
B.C. Equipment Co.

# PRATT AND WHITNEY

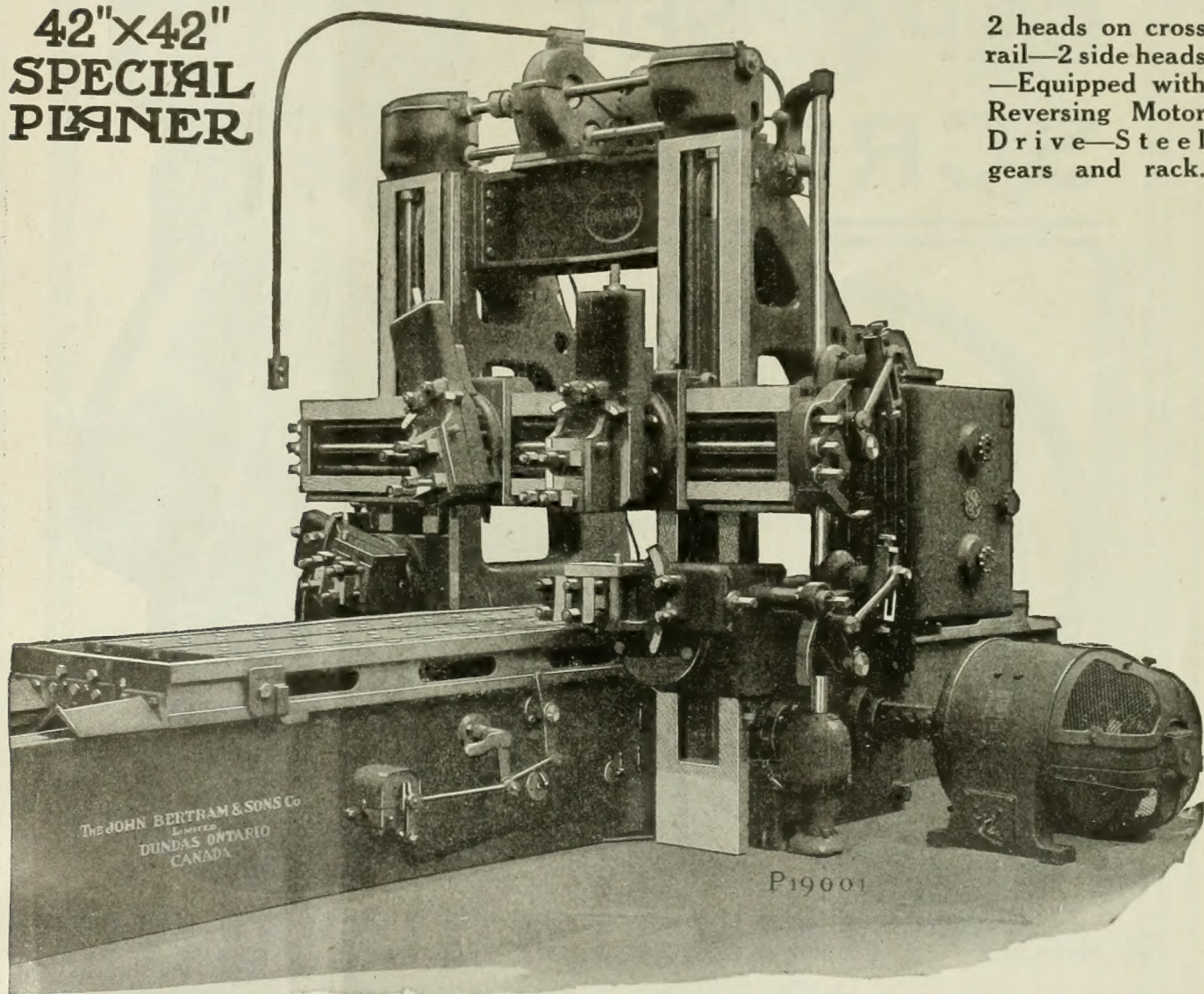


# The BERTRAM MACHINE TOOLS Page



**42"×42"  
SPECIAL  
PLANNER**

2 heads on cross  
rail—2 side heads  
—Equipped with  
Reversing Motor  
Drive—Steel  
gears and rack.



## The John Bertram & Sons Co., Limited

DUNDAS. ONTARIO. CANADA.

MONTREAL  
723 Drummond Bldg.

TORONTO  
1002 C.P.R. Bldg.

VANCOUVER  
609 Bank of Ottawa Bldg.

WINDSOR  
Davis Bldg.

WINNIPEG  
1205 McArthur Bldg.

HALIFAX  
Roy Bldg.

*If interested tear out this page and place with letters to be answered.*



# NAMCO

## U.S. STANDARD CAP AND SET SCREWS

### STANDARD

V. & U.S.S. Semi-finished  
Nuts  
V., U.S.S. & S.A.E. Cap Screws  
V. & U.S.S. Set Screws  
S.A.E. Plain & Castellated Nuts

### SPECIAL

Screw machine product up to  
2 1/4" diam. — to specifications  
Hardened and ground screw  
product — to specifications



**THE NATIONAL ACME COMPANY**  
MONTREAL, P.Q.

De Courcelles

G. T. R. R.

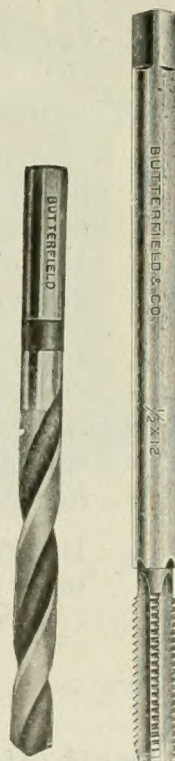
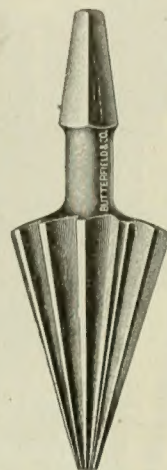
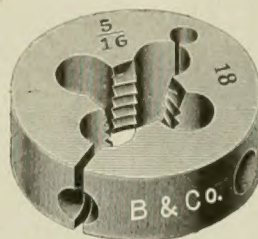


# Butterfield

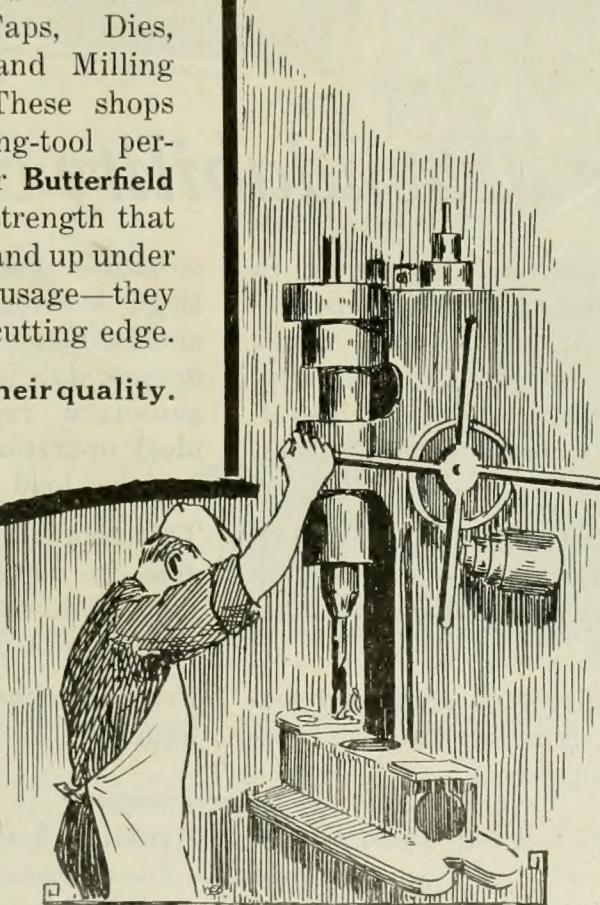
## Tools that Assure Maximum Production

**I**N the big shops and the small shops you will find **Butterfield** Taps, Dies, Drills, Reamers and Milling Cutters in use. These shops know what cutting-tool perfection means, for **Butterfield** tools possess the strength that enables them to stand up under continuous hard usage—they retain their keen cutting edge.

A trial will prove their quality.



*"The Tools  
You Buy  
Again"*



## BUTTERFIELD & COMPANY DIVISION

### UNION TWIST DRILL CO.

#### Stores:

220 King Street West, Toronto.  
131 St. Paul St. West, Montreal.

Rock Island, Que.

#### Agents:

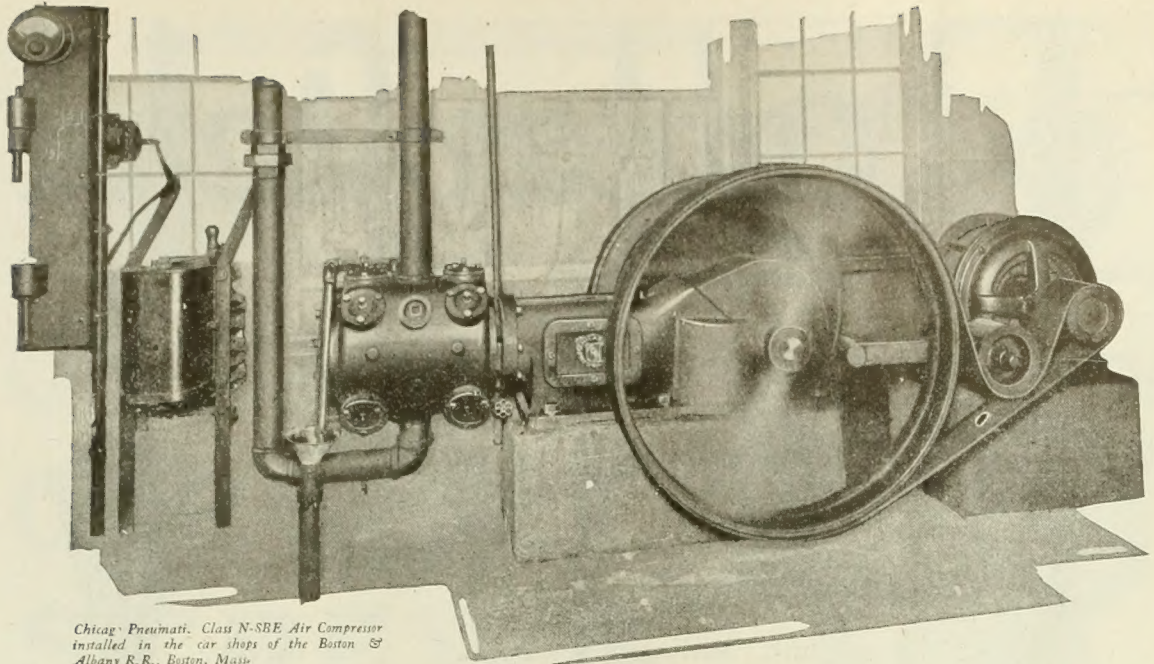
D. Phillip, 138 Portage Ave., Winnipeg, Man.  
The Triangle Co., Standard Bank Bldgs., Vancouver, B. C.

#### Foreign Agents:

FOREIGN REPRESENTATIVES: Great Britain, Geo. H. Alexander, 83-84 Colleshill St., Birmingham, England; France, Italy, Belgium and Switzerland, Fenwick Freres, 8 Rue de Rocroy, Paris; Sweden, Norway and Denmark, Ab. Sigfr. Anderson & Co., Malmö; Spain, Casamitjana Hermanos, Barcelona; Japan, Abe-Kobei & Co., Yokohama; Greece, Stephen C. Stephanson, 11 Lycourgan St., Athens; Netherlands, Wynmalen & Hausman, Rotterdam; Australia, H. R. Richardson, 82 Pitt St., Vickery's Chambers, Sydney; South America, Charles Dreyfus, B. Mitre, 785, Buenos Aires, R.A.; South Africa, H. Parker Wood, Cape Town, Durban and Johannesburg.

*If interested tear out this page and place with letters to be answered.*





Chicago Pneumatic Class N-SBE Air Compressor  
installed in the car shops of the Boston &  
Albany R.R., Boston, Mass.

## *Where dependability counts big!*

**T**HE user of air power in moderate quantities—particularly with but one unit—needs *real* compressor dependability. In such plants an enforced shut-down means 100% air output loss.

In reality this Chicago Pneumatic Short-Belt Motor-Driven Air Compressor is a large Chicago Pneumatic “under a reducing glass.”

It embodies such advanced features as: Simplate flat-disc inde-

structible valves, exceptionally large bearing surfaces, totally enclosed frame construction, automatic lubrication throughout, automatic regulation, insuring ideal operating economy under variable load demands.

This compact type unit is available in capacities from 69 to 1197 cubic feet per minute, for any form of drive.

Prompt delivery. Ask for Bulletin 418.

*Sales Representatives*

**The Holden Company, Limited**

354-356 St. James Street, Montreal, Canada

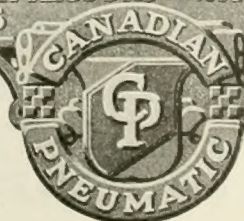
Sales and Service Branches: TORONTO, 342 Adelaide Street, West WINNIPEG, 150 Princess Street VANCOUVER, 81 Pender Street  
Canadian Factory: Canadian Pneumatic Tool Company, Montreal

C 96 H

BOYER PNEUMATIC HAMMERS · LITTLE GIANT PNEUMATIC AND ELECTRIC TOOLS  
CHICAGO PNEUMATIC AIR COMPRESSORS · VACUUM PUMPS · PNEUMATIC HOISTS  
GIANT OIL AND GAS ENGINES · ROCK DRILLS · COAL DRILLS

**CHICAGO**

*The Compressor with*



**PNEUMATIC**

*the Simplate Valve*

*If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.*





# BALL-BEARING DRILLS

**T**HE chief direction in which the modern ball-bearing drill excels the old type of so-called sensitive drill may be briefly indicated by three words: Output, Convenience, and Durability.

To obtain the highest excellence in these three directions, every element and part of the machine has had to receive close attention both in design and in manufacture.

The design of our Ball Bearing Drills is the result of exhaustive experiments and a long experience in the manufacture of drilling machines. The patent self-acting feed is a valuable aid to increased output. The operator has only to start the drill, the feed does the rest. This relieves the operator of all tedious work in pulling the feed lever.

The materials used in the construction of these Drills are submitted to chemical and physical tests in our own laboratory to ensure a high standard being maintained.

The factory at Edgwick, where the Ball Bearing Drills are made, is equipped with the most up-to-date appliances for the production of interchangeable parts.

The extensive use of jigs and special tools, together with a rigid system of detail inspection, ensures accurate workmanship.

Machines are made with one, two, three and four spindles with hand feed plain, auto feed plain, or auto feed geared spindles in any combination.

A copy of our new booklet, Rapid Drilling, will be sent post free to anyone interested.

*Delivery from Stock.*

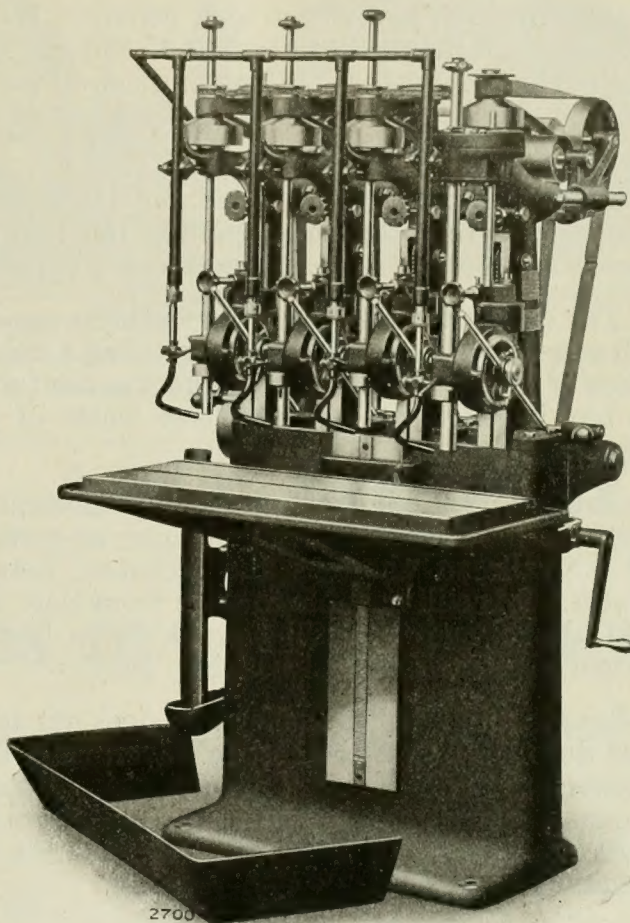
## ALFRED HERBERT, LTD.

Phone No.  
4409 Adelaide

1-3 Jarvis St., Toronto  
Head Office and Works: Coventry, England

New York Office  
54 Dey St.

Turret Lathes, Engine Lathes, Horizontal Boring Machines, Boring Mills, Planing Machines, Slotting Machines, Shaping Machines, Profiling Machines, Grinding Machines, Sawing Machines, Precision Machines, Chucks, Die Heads, Tool Room Equipment, Foundry Equipment, Drills, Milling Cutters and Small Tools.



*If interested tear out this page and place with letters to be answered.*



# What Would You Think of a Manufacturer—

—who wrote to you with a lead pencil—"We are saving much money because we do not use typewriters and telephones"? You might well wonder whether his merchandise was as much out of date as his business methods.

You know that modern time and labor saving appliances are not added expenses, but that they have superseded slower and more costly processes.

The concern which uses your business paper to tell you its business story is simply using a modern piece of selling machinery to make it easier for you to buy intelligently with the least waste of your time and theirs.

For the right kind of advertising shortens the distance between human minds just as certainly as the railroad shortens the distance between places. It is still possible to walk from New York to Chicago, and it is still possible for a business to get along without advertising, BUT—

—bear in mind that the seller who does not advertise does NOT save the cost of advertising, for it costs more to do the work of advertising by other means. Consistent advertisers are progressive merchandisers, and it pays to do business with them.

You are invited to consult us freely about  
Business Papers or Business Paper Advertising.

## THE ASSOCIATED BUSINESS PAPERS INC.

*The International Association of Trade and Technical Papers*

Headquarters, 220 West 42nd Street, New York

Oil News  
Oil Trade Journal  
Plumber and Steam Fitter  
Power  
Power Boating  
Power Farming Dealer  
Power Plant Engineering  
Price Current—Grain Reporter  
Printers' Ink  
Railway Age  
Railway Electrical Engineer  
Railway Maintenance Engineer  
Railway Mechanical Engineer  
Railway Signal Engineer

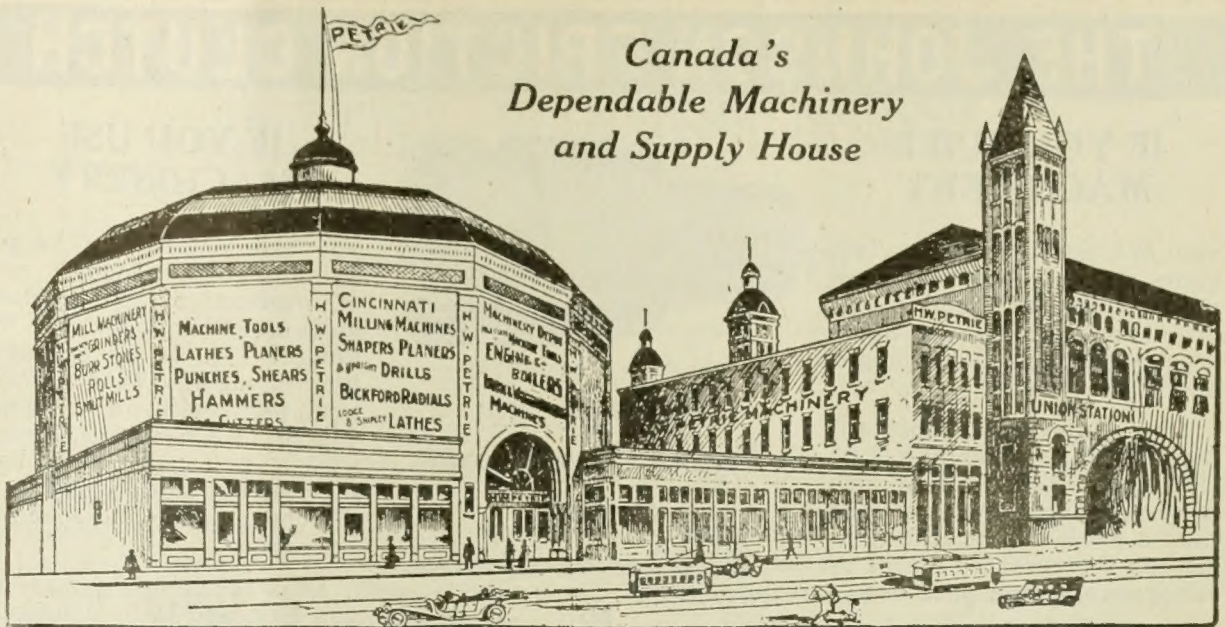
Retail Lumberman  
Rubber Age  
Shoe Findings  
Shoe and Leather Reporter  
Shoe Retailer  
Southern Engineer  
Southern Hardware & Implement  
Journal  
Sporting Goods Dealer  
Starchroom Laundry Journal  
Tea and Coffee Trade Journal  
Textile World  
Welding Engineer  
Woodworker

## LIST OF MEMBERS

*Each has subscribed to and is maintaining the highest standards of practice in their editorial and advertising service.*

Advertising and Selling  
American Architect  
American Blacksmith  
American Exporter  
American Funeral Director  
American Hatter  
American Machinist  
American Paint Journal  
American Paint and Oil Dealer  
American Printer  
American School Board Journal  
Architectural Record  
Automobile Dealer and Repairer  
Automobile Journal  
Automotive Industries  
Bakers Weekly  
Boiler Maker  
Boot and Shoe Recorder  
Brick and Clay Record  
Buildings and Building Management  
Building Supply News  
Bulletin of Pharmacy  
Canadian Grocer  
Canadian Machinery and Mfg. News  
Canadian Railway & Marine World  
Candy and Ice Cream  
Chemical & Metallurgical Engineering  
Clothier and Furnisher  
Coal Age  
Coal Trade Journal  
Concrete  
Cotton  
Daily Metal Trade  
Distribution and Warehousing  
Domestic Engineering  
Dry Goods Economist  
Dry Goodsman  
Dry Goods Reporter  
Electric Railway Journal  
Electrical Merchandising  
Electrical Record  
Electrical World  
Embalmer's Monthly  
Engineering and Contracting  
Engineering and Mining Journal  
Engineering News-Record  
Factory  
Farm Implement News  
Farm Machinery—Farm Power  
Fire and Water Engineering  
Foundry (The)  
Furniture Journal  
Furniture Manufacturer and Artisan  
Furniture Merchants' Trade Journal  
Gas Age  
Gas Record  
Grand Rapids Furniture Record  
Haberdasher  
Hardware Age  
Hardware and Metal  
Heating and Ventilating Magazine  
Hide and Leather  
Hospital Management  
Hotel Monthly  
Hotel Review  
Illustrated Milliner  
Implement and Tractor Age  
Implement & Tractor Trade Journal  
Industrial Arts Magazine  
Inland Printer  
Iron Age  
Iron Trade Review  
Lumber  
Lumber Trade Journal  
Lumber World Review  
Manufacturers' Record  
Manufacturing Jeweler  
Marine Engineering  
Marine Review  
Millinery Trade Review  
Mill Supplies  
Mining and Scientific Press  
Modern Hospital  
Motor Age  
Motorcycle and Bicycle Illustrated  
Motor Truck  
Motor World  
National Builder  
National Petroleum News  
Nautical Gazette  
Northwest Commercial Bulletin  
Northwestern Druggist  
Nugent's, The Garment Weekly.





130,000 Square Feet of Floor Space Filled With Up-to-Date Machinery.

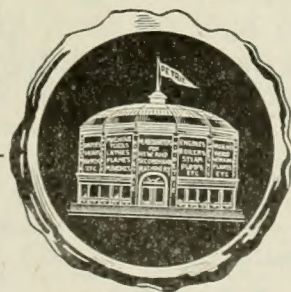
## MACHINERY AND SUPPLIES

### Opportunities in Used Tools

From time to time we have some excellent opportunities in slightly used machine tools. These tools are warranted to give satisfactory service and they can be secured at very low prices. You are urged to let us know the

class of tool you need. Included in the list are: Arbor Presses, Bolt Cutters, Boring Mills, Drills, Grinders, Lathes, Milling Machines, Shapers, Planers, Punches and a variety of other machine tools.

Enquiries promptly answered.



**H. W. PETRIE LIMITED**  
TORONTO and HAMILTON



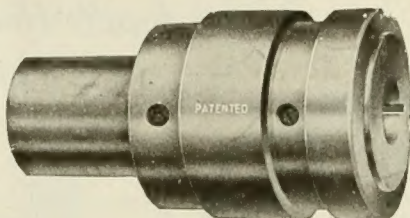
# THE JOHNSON FRICTION CLUTCH

## IF YOU BUILD MACHINERY

you are anxious to put into your product every refinement which will add to its efficiency—which will make it serve your customer longer and more satisfactorily.

One of the most important features of any machine is its clutches. No single item adds more to machine performance than a good clutch, and nothing can be a greater source of annoyance than a poor one.

Play safe and equip with Johnson Clutches.



## IF YOU USE MACHINERY

you are looking for the machine with the highest rate of production, the smallest amount of lost time, and the longest life. In all probability you will find that machine equipped with a Johnson Clutch, for the Johnson Clutch not only gives best service, but adds greatly to the convenience and speed of operation.

Look for it on the machine you buy, and to be consistent equip your plant transmission in the same way.

*Write for our  
Yellow Catalog and  
Booklet  
"Clutches as Applied  
to  
Machine Building"*

CANADIAN AGENTS:

**WILLIAMS & WILSON, LTD., 84 Inspector St., Montreal**  
**CANADIAN FAIRBANKS-MORSE CO., LIMITED, Montreal, Toronto, Winnipeg**

**THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.**

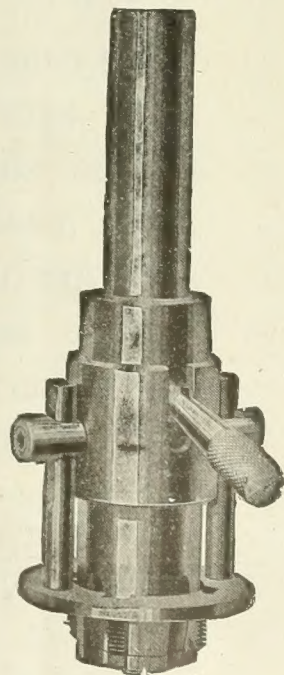
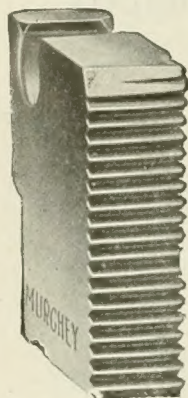
*Talk About Saving Time and Labor—*

## Murchey Collapsing Taps and Self-Opening Dies

will boost your production fifty per cent. and at the same time turn out better and more economical work than ordinary tools.

Murchey Tools are built for long, hard service. The fine materials and workmanship, their extremely simple design and rugged construction, enable clean, accurate threading under all conditions.

If you would experience a new kind of tap and die satisfaction send for a trial order of Murchey Taps and Dies.



## Murchey Machine & Tool Company

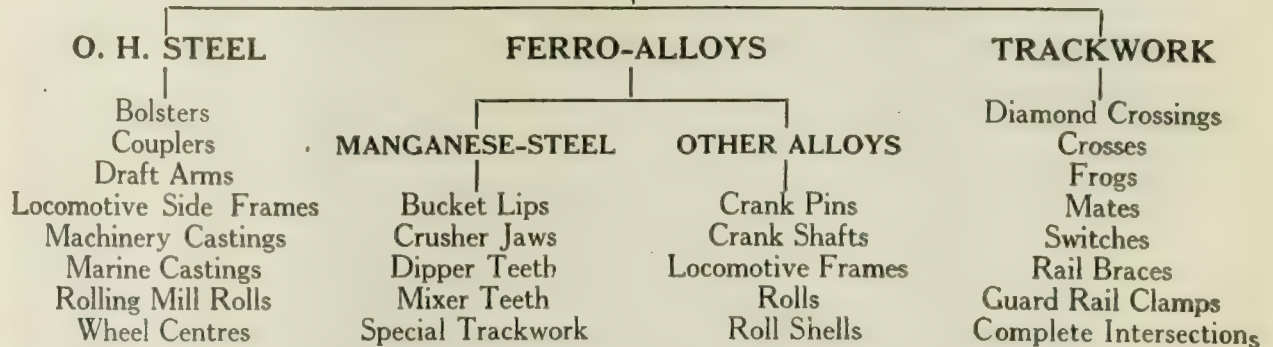
75 Porter Street, Detroit, Mich.

Coats Machine Tool Co., London, Glasgow, Newcastle, Eng.  
Fenwick Freres & Co., Paris, France



# CANADIAN STEEL FOUNDRIES LIMITED

## AMONG OUR PRODUCTS



This list is merely an indication

General Offices:

Transportation Building, Montreal

## WE CAN SUPPLY STEEL PLATE

—IN—

**Universal Edge** - up to 40 in. wide

**Sheared Edge** - up to 60 in. wide

**Any Thickness**

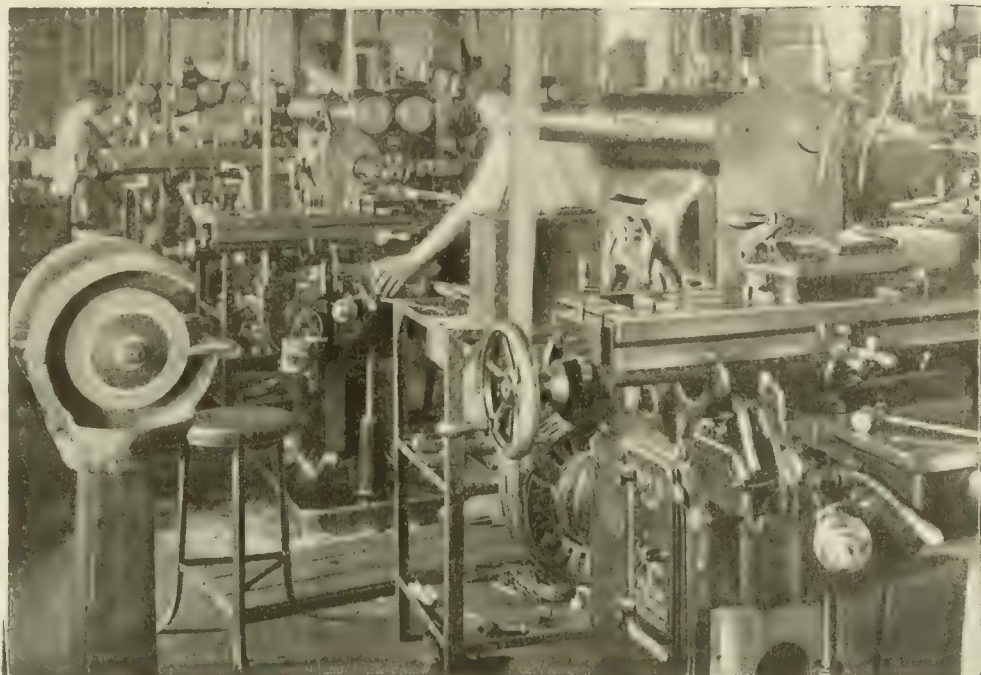
**Any Lengths**

Send Us Your Enquiries.

**Dominion Foundries & Steel, Limited**  
HAMILTON, ONTARIO



# MILWAUKEE MILLING MACHINES



"A Battery of 'Milwaukees' on accurate tool work in the plant of the Continental Tool Works, Detroit.

**Everywhere,  
In Shops That Insist  
On The BEST**

**Y**OU'LL find Milwaukee Milling Machines fast friends of shops that install nothing but the highest class equipment.

Positive alignment of the arbor is provided by the Double Overarm, consisting of two steel bars accurately parallel with the spindle.

The Automatic Flooded Lubrication System lubricates all bearings and gears in the column, feed box and pulley bracket. Each machine also possesses an Automatic Cutter Lubricating System which functions only when the spindle revolves or cutter lubricant may be shut off. All levers and handles are conveniently located to assist in ease of operation, making them popular with operators.

These are a few of the features representative of "Milwaukee" engineer's forethought in superior design and construction. For complete facts get our catalogue.

**KEARNEY & TRECKER**  
CORPORATION  
**MILWAUKEE, WIS., U.S.A.**

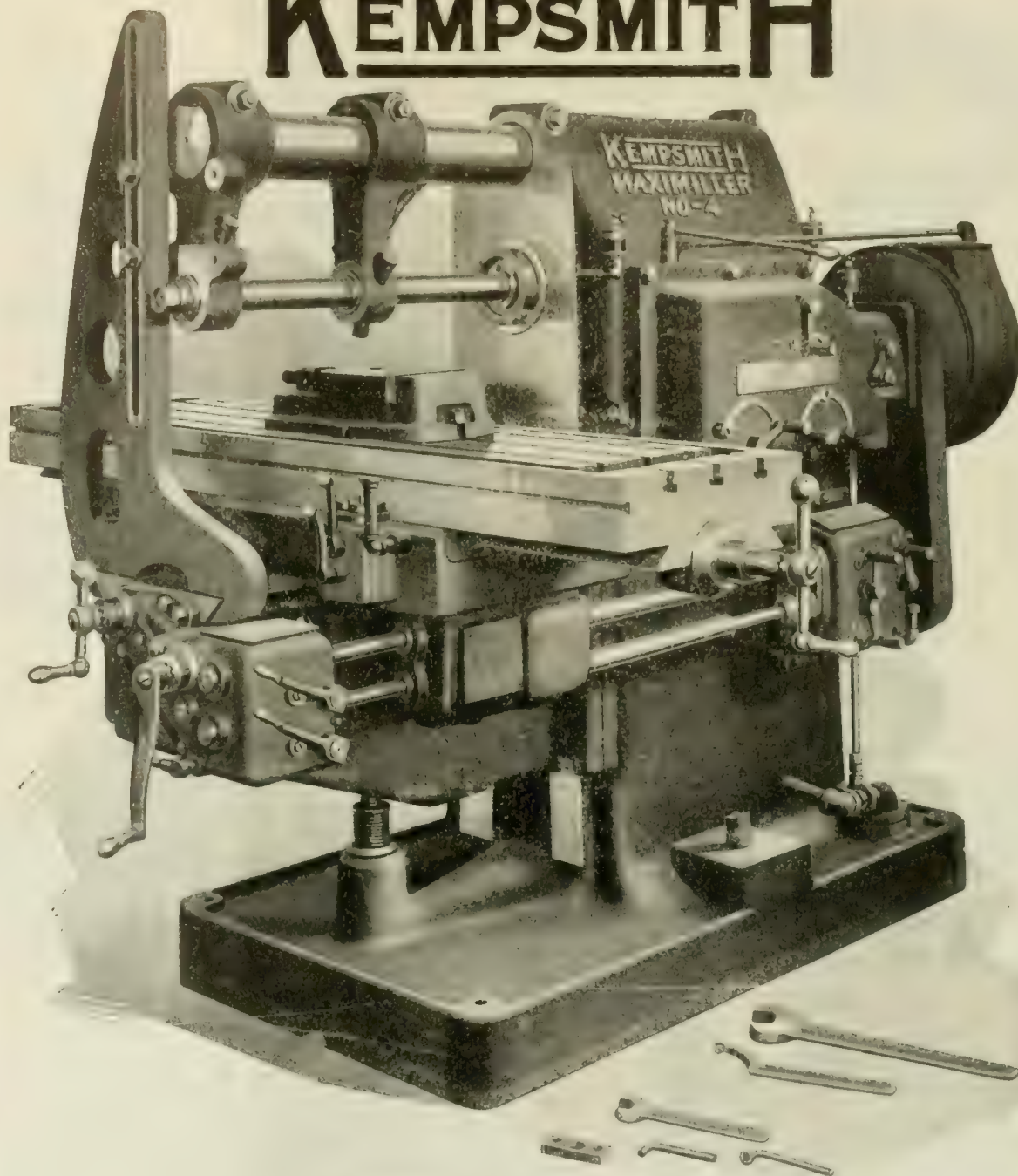
Canadian Representatives:

Williams & Wilson, Ltd., Montreal; F. F. Barber Machy. Co.,  
Toronto; A. R. Williams Machy. Co., Vancouver and Winnipeg





# KEMPSMITH



**KEMPSMITH No. 4 Plain Maximiller**

A veritable maximum in milling machines embracing all Kempsmith patented features, permitting a maximum in production and efficiency. Write for particulars as to this machine.

## THE KEMPSMITH MANUFACTURING CO. MILWAUKEE, WIS., U.S.A.

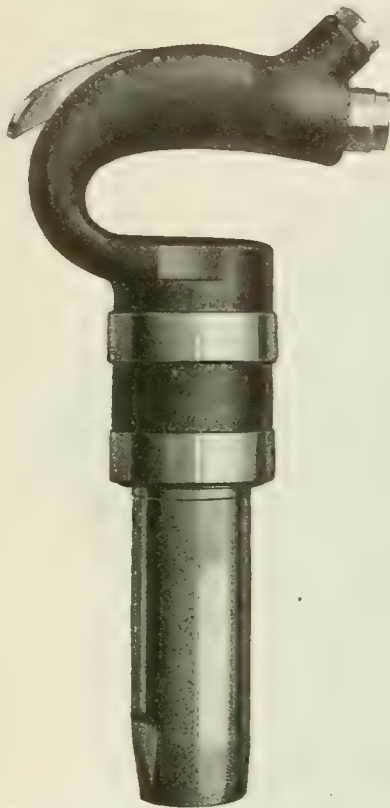
FOREIGN DEALERS:—American Trading Co., 25 Broad Street, New York, N.Y. (Japan); Barandiaran & Co., 3 Alameda, San Sebastian, Spain; Bevan & Edwards Pty., Ltd., 117 King Street, Melbourne, Australia; Blair, Reed & Company, 211 North 9th St., Willington, N.Z.; Bloxham, Edgar, 12 Rue Du Delta, Paris, France; 245 W. 12th St., New York City; L. S. Devos, Grand Central Palace, New York City; Herbert, Alfred, 51 Dey Street, New York City; Nielsen & Winther, Blegdamsvej 60, Copenhagen, Denmark; 24 Stone Street, New York City; Parke & Lacy Co., 60 Clarence Street, Sidney, N.S.W., Aust.; Selson Engr. Company, 85 Queen Victoria St., London, E. C.; England; Corso Vittorio Emanuele 11, No. 9, Turin; 5 Piazza Castella,

Milan, Italy; 24 Stone Street, New York City; Pascual Teja, La Capuchinas, No. 65, Mexico, D.F.; Splithoff, Beuwkes & Co., Leuvehaven, W.Z. 159, Rotterdam, Holland; Turner, Hoare & Co., Ltd., Lansdowne Road, Post Box No. 195, Bombay, India; Charter & Gardiner, 53 Calle Echague Santa Cruz, P. O. Box 1201, Manila, Philippine Is.; Societe Anonyme Belge Alfred Herbert, Rue De Laeken, 35a & 35b, Brussels, Belgium.

CANADIAN DEALERS:—The Geo. F. Foss Machinery & Supply Co., Limited, 305 St. James St., Montreal, Canada; General Supply Co., 38 Toronto St., Toronto, Canada.

*If interested tear out this page and place with letters to be answered.*





### CLEVELAND "FOUNDRY" CHIPPERS

*Are Dust-Proof      Easy To Hold      Easy To Control*

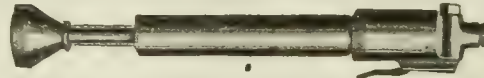
#### A Remarkable Tool for Fast Chipping

Made in "Seventeen" sizes with "Open" or "Enclosed" handles—  
Outside or Inside Latch.

### CLEVELAND FOUNDRY RAMMERS

For Floor - Flask - Bench or Core Work

Run Fast  
Hit Hard



Have No  
Vibration

*Cleveland Rammers Are "Dust-Proof"*



*They cost less for "Up-Keep" than any Rammer made.*

### BOWES AIR HOSE COUPLINGS

AND

### CLECO PRESSURE-SEATED AIR VALVES

*"Are Standard Equipment Everywhere"*



Style P.O.



Cut shows Never-Slip Clamp Attached.  
Write for Bulletins Nos. 44-48



Style A.

IN STOCK: Riveting Hammers, Piston Air Drills, Corner Drills,  
Compound Drills, Portable Grinders, Etc.

**CLEVELAND PNEUMATIC TOOL CO., OF CANADA, LIMITED**

84 Chestnut St., Toronto, Ont.

337 Craig St., Montreal, Que.

# GREY IRON CASTINGS

*Also*

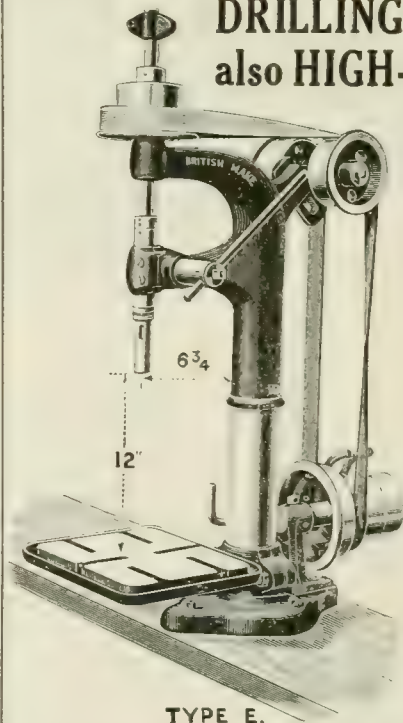
**Brass, Bronze,  
Aluminum, Copper,  
Zinc and Nickel  
Castings**

**QUALITY!  
SERVICE!**

**Canadian Hanson and Van  
Winkle Co., Limited**

Toronto - - - Canada

## SENSITIVE BENCH and PILLAR DRILLING MACHINES also HIGH-CLASS BALL BEARING DISC and TOOL GRINDERS



TYPE E.

TEN DIFFERENT  
TYPES, ALL  
FROM STOCK

Telegrams:—  
"BEACO TIPTON"  
ENGLAND

Telephone:—  
90 TIPTON

Code used:—  
ABC 5th EDITION

**AGENTS  
WANTED**

**Beacon Engineering Co.  
TIPTON, ENGLAND**



## Steelworks Plant and Hydraulic Machinery

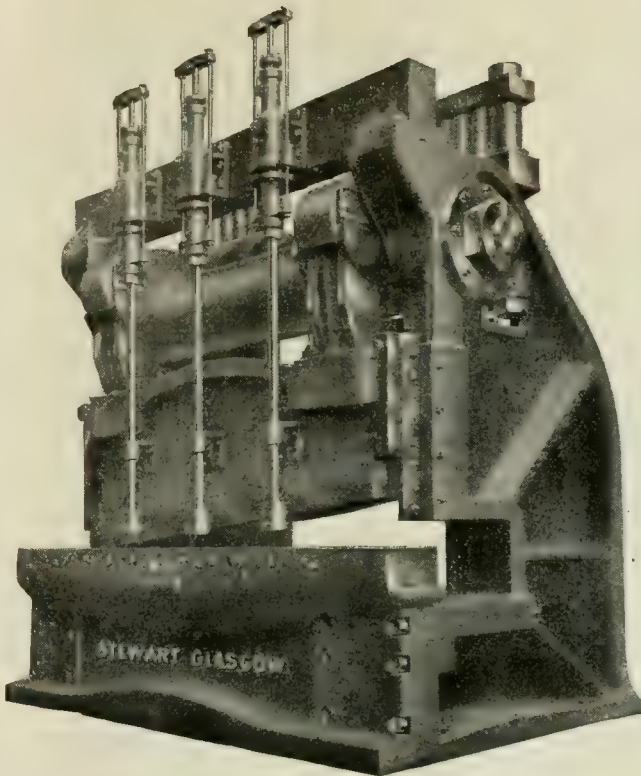
ROLLING MILLS  
BLOOM, SLAB, BILLET AND  
PLATE SHEARS  
FORGING PRESSES  
TUBE DRAW BENCHES  
TROUGHING PRESSES  
HYDRAULIC PUMPS

**Duncan Stewart & Co., Ltd.**

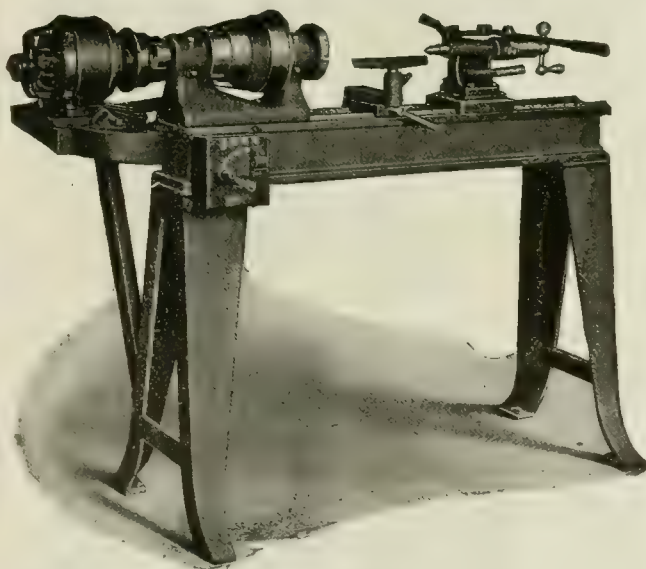
LONDON ROAD IRON WORKS

**GLASGOW**

ESTABLISHED 1864



1 1/4 in. x 8 ft. Steam Hydraulic Plate Shears



### Built For Service

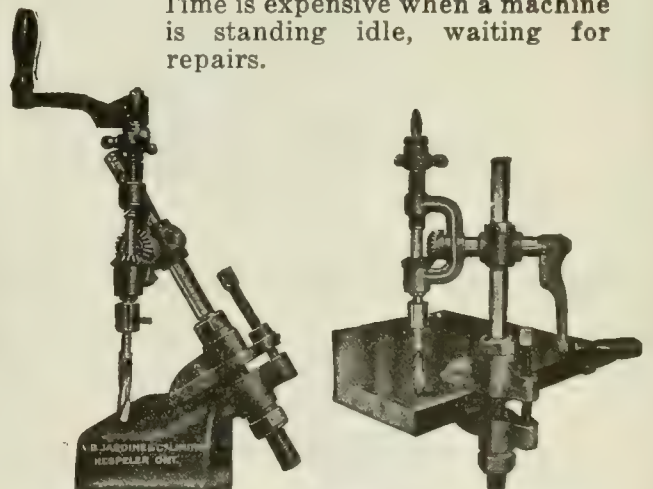
This BLOUNT Motor-driven Lathe is well adapted to all speed lathe uses. It is of late design, and has a number of features in which you will be interested. Provided with constant-speed motor. Lathe spindle made of hollow, high-carbon steel, ground to size and bored for Morse taper. Runs in self-oiling bronze bearings.

"We will accept Canadian funds at par"

**J. G. Blount Co.,**      **Everett, Mass., U.S.A.**

## Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, \$26.50 net.  
Sold by all Machinery and Supply Houses.

**A. B. JARDINE & CO., Limited**  
HESPELER, ONTARIO



# Gears



Let us figure on your  
Gear Requirements

Hamilton Gear  
& Machine Co.

Van Horne St. TORONTO

## *The Art of Making Files*

Some of our operatives have been making files since they were boys—and they are now old men.

The accumulation of expert knowledge and experience that goes into the making of our files is worth much to you.

It means that when you buy one of the following brands you have a finished product of the art of file making:

Kearney & Foot  
Great Western  
American  
Arcade  
Globe

# FILES

*Made in Canada by*

*Nicholson File Co.*  
Port Hope - Ontario



TRADE

MARK

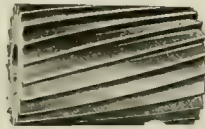


Special Sizes Given Careful  
Attention

Standard Sizes Carried  
in Stock

# A.W. HIGH SPEED AND CARBON STEEL MILLING CUTTERS

Plain Mills  
Side Mills  
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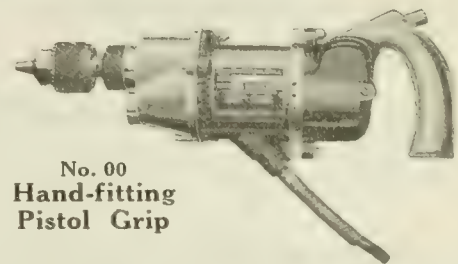
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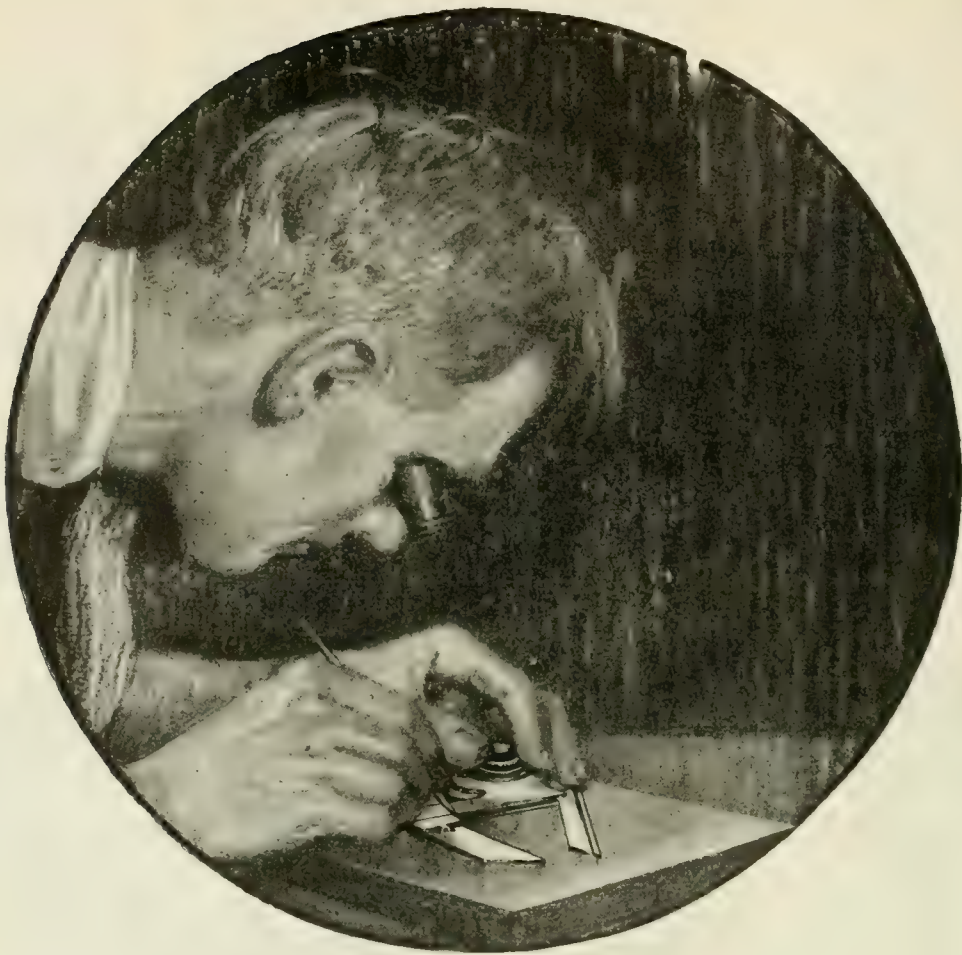
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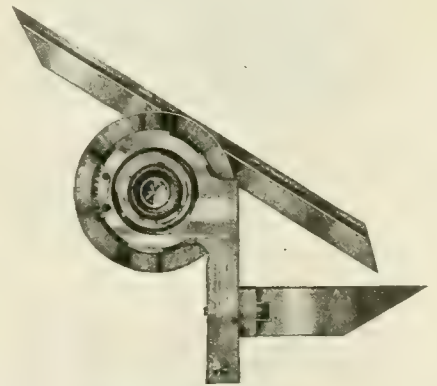




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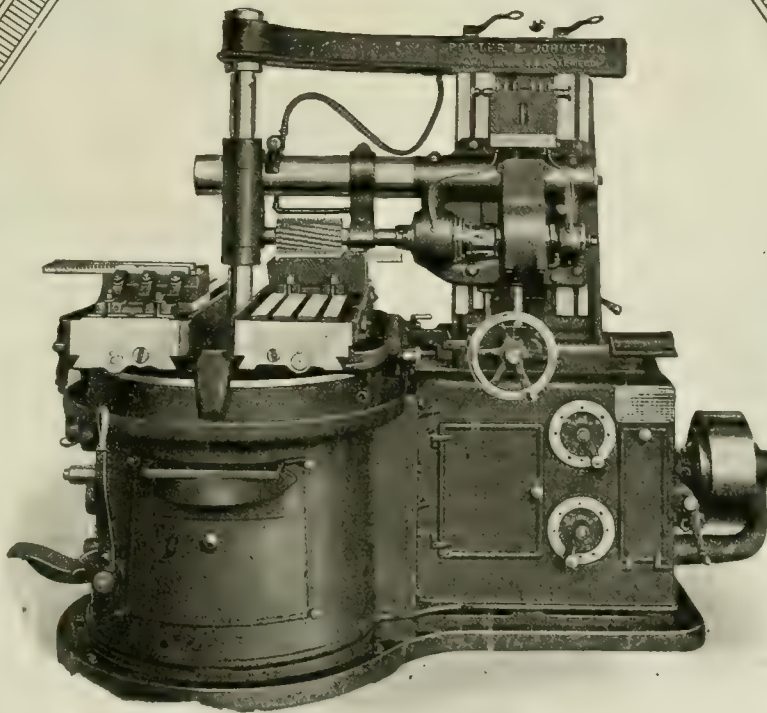
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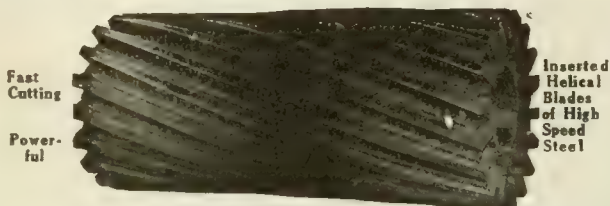
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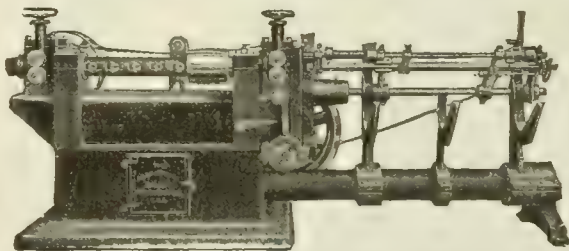
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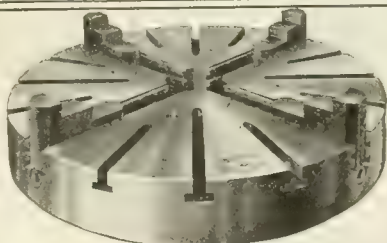
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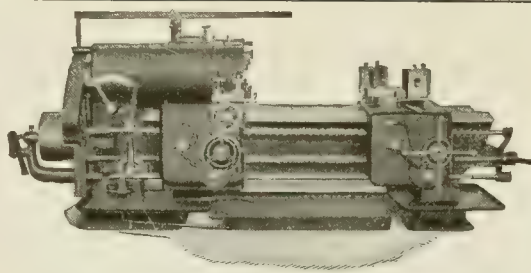
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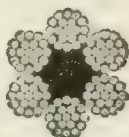
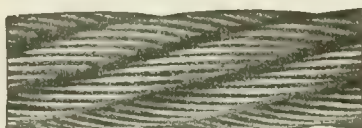
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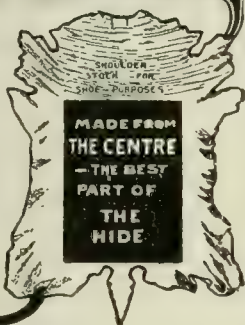
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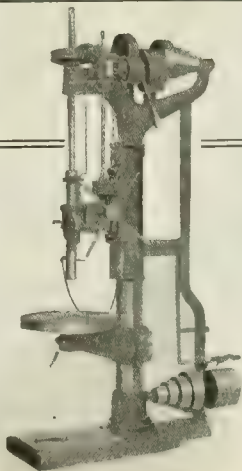
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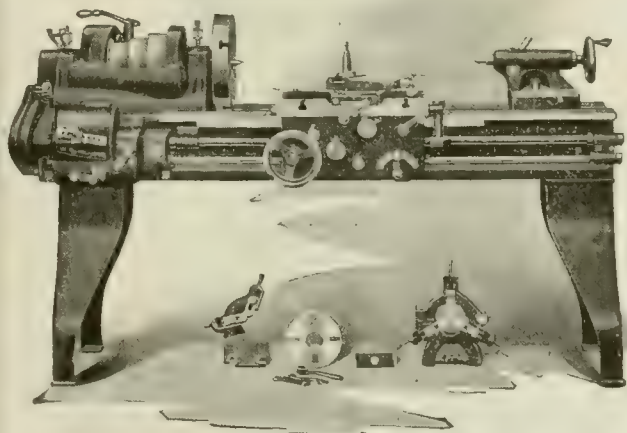
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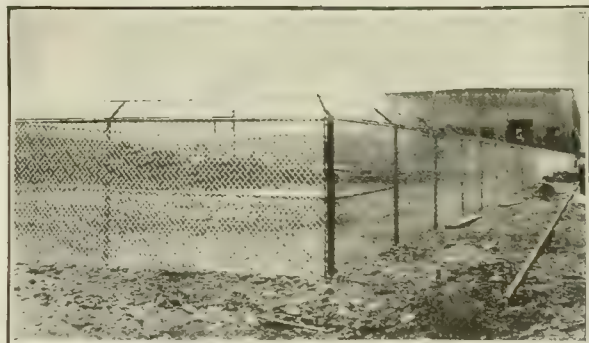
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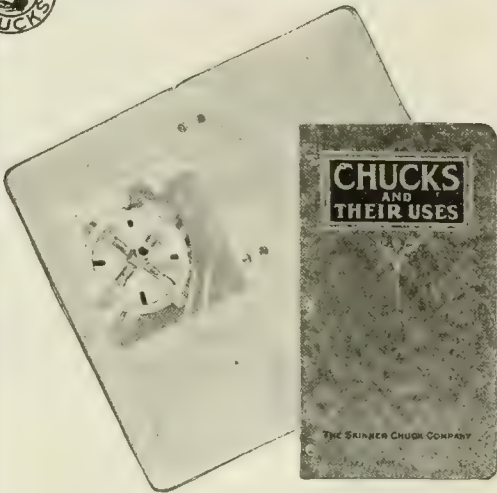
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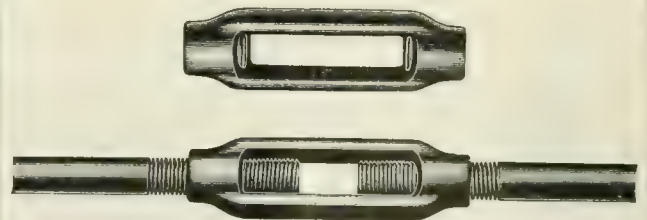
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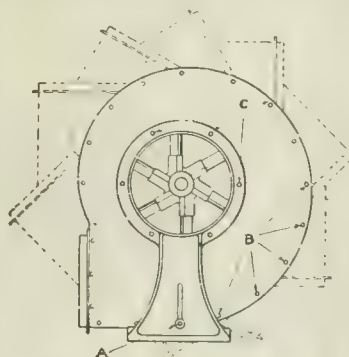
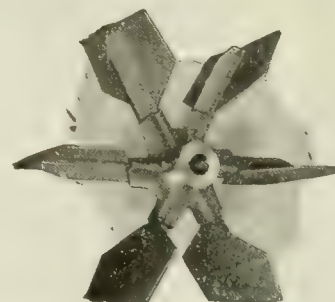
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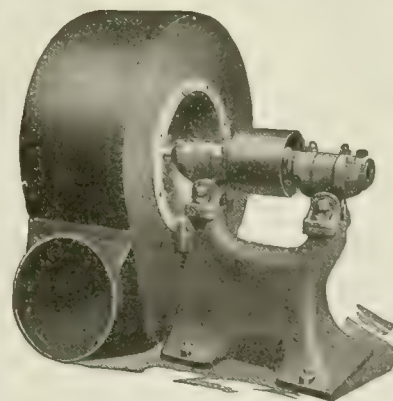
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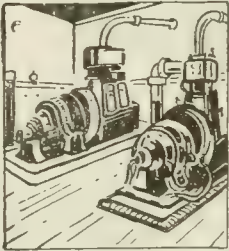
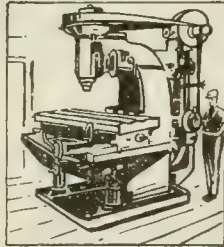
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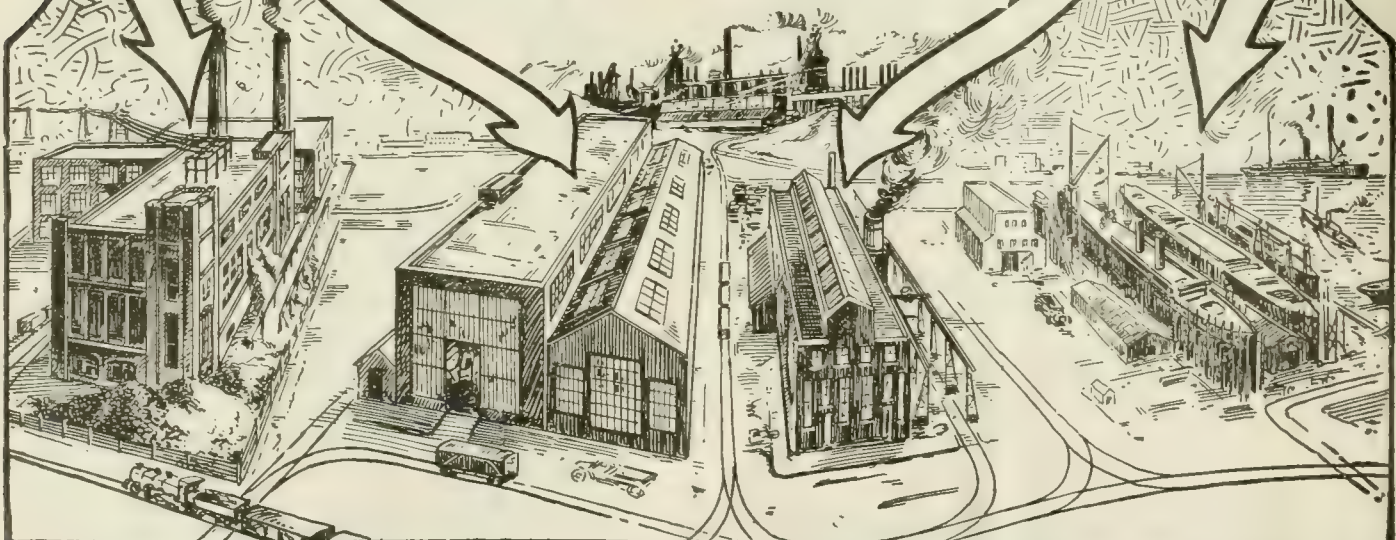
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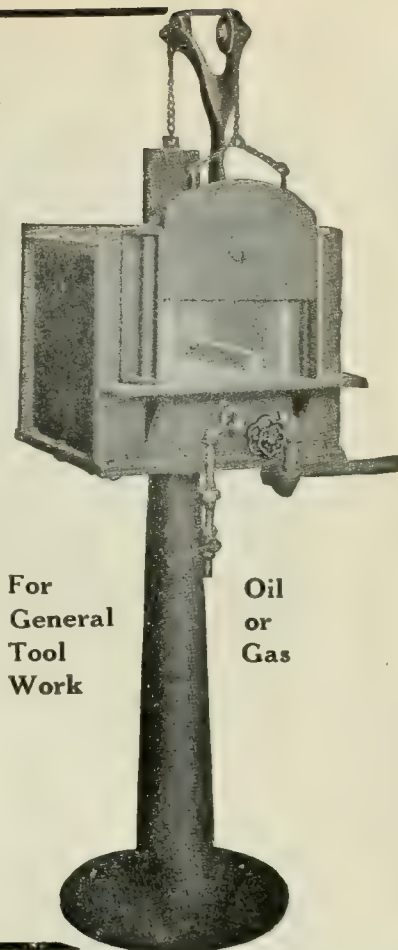
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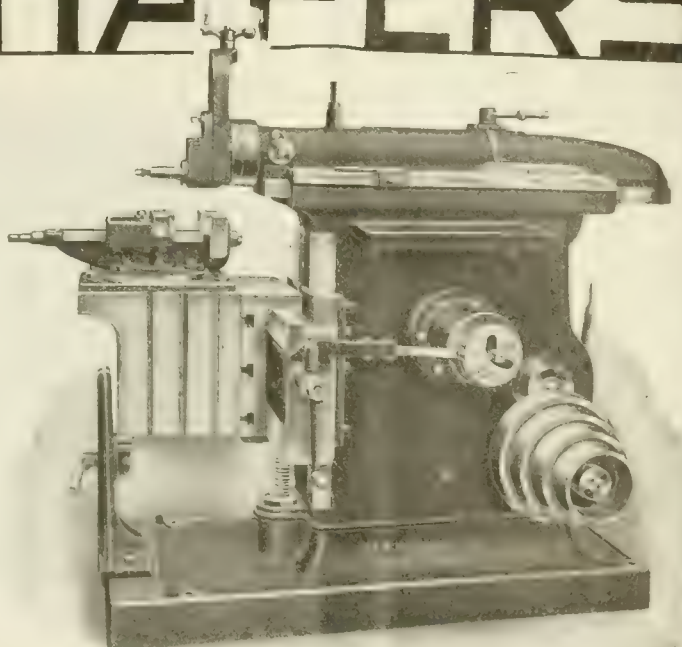
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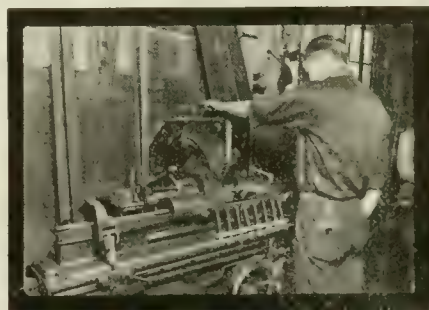
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Grinding Push Rod Shanks, Norton Wheels, 24 Combination M, 20 in. x 4 in. x 12½ in.

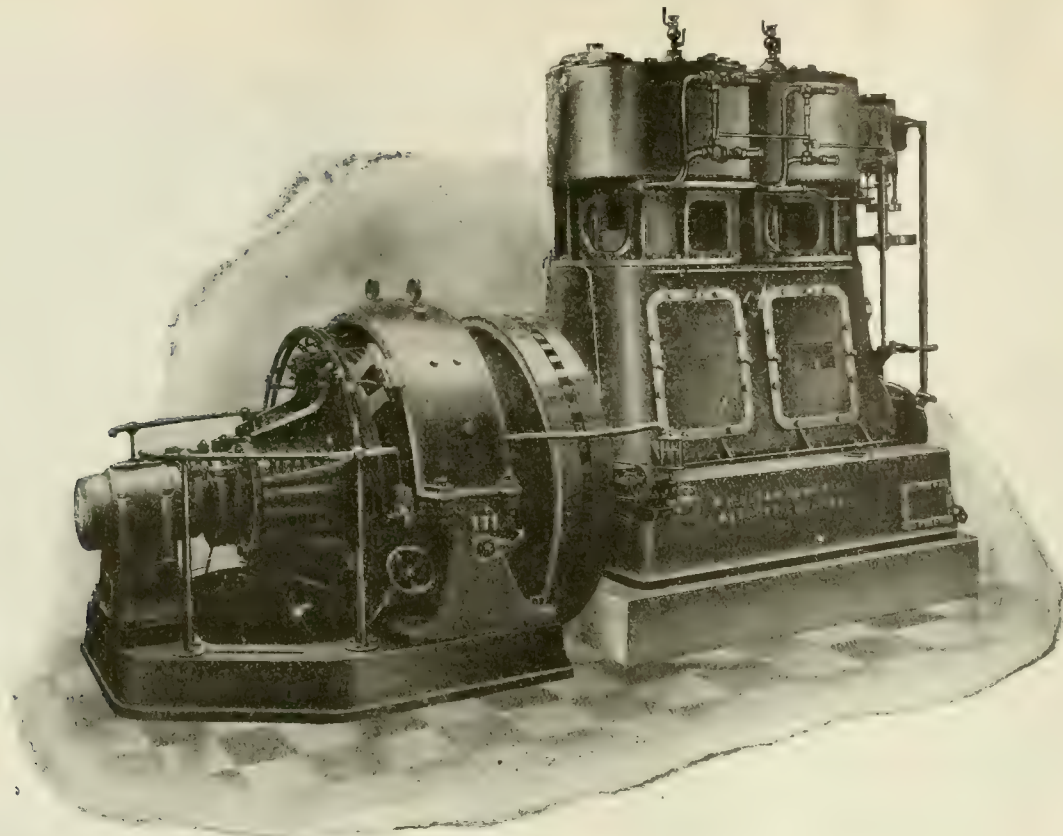


Finish Grinding Valve Heads, Norton Machine, Norton Alundum Wheel, 24-M, 20 in. x 2 in. x 12½ in.



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# CANADIAN MACHINERY

## AND MANUFACTURING NEWS

VOL. XXV. No. 10

March 10, 1921

### Milling Practice

Efficient Milling Means Increased Production—Varied Examples, Including Use of Attachments and Special Fixtures.

By J. H. Moore

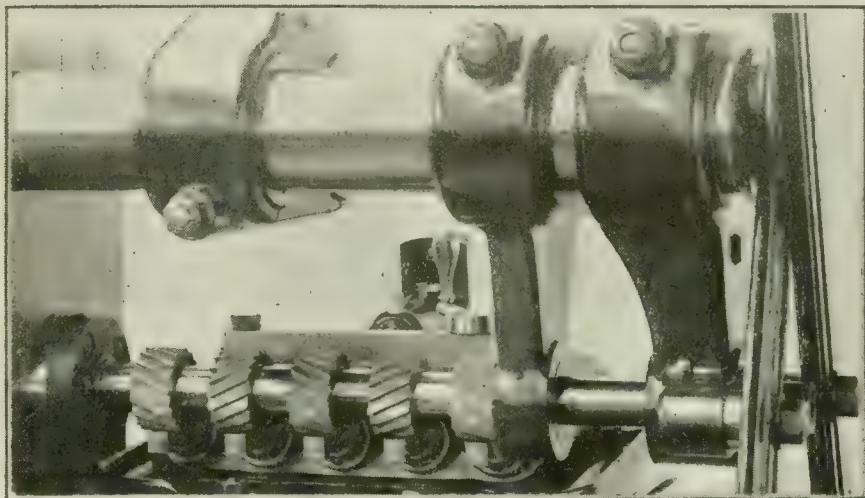


FIG. 5—MILLING SQUARE PUNCHES IN SERIES OF FIVE.

THE field of usefulness for milling machines has greatly increased within the past few years. At one time they were rather looked upon as a good type of machine for a limited variety of work, but that viewpoint has been entirely swept away, thanks to the necessity of increased production and interchangeability. Let anyone take a tour through a modern-equipped manufacturing plant and there they will see, not merely a few scattered milling machines, but regular batteries of them, all lined up to handle the work in operation sequence.

Whenever necessary, the regular machine is supplemented by special fixtures and cutters to increase production, the idea being to secure both speed and interchangeability.

Of course, there are numerous styles and sizes of such millers, but there is no need to enter into this phase of the question, as anyone desirous of becoming acquainted with the different types of machines on the market need only look through the advertising pages of any technical journal, such as the one they are reading. In fact, it is an education in itself to peruse and study the contents of the advertising pages of any up-to-date technical magazine.

It is not the intention of the writer, however, to moralize on the advantages of the advertising pages, so let us get back to the subject of milling machines.

There is no need to delve into any particular design, for this information can be gleaned from the catalogue pages of the various makes. Let us leave all these points behind, and describe the phase of milling that the man in the shop is most interested in, namely, actual problems. We will, in as far as possible, illustrate a varied class of work, and we are indebted to the Kearney & Trecker Co., also the Kempsmith Manufacturing Co., both of Milwaukee, Wis., for the use of the illustrations in this article. They are actual examples of problems solved for various manufacturing plants by the makers of this particular type of miller, and show clearly what can be done in the way of miller production. Figs. 1 to 10 illustrate K. & T. practice, while Figs. 11 to 13 de-

pict some work done on Kempsmith machines.

Let us commence at Fig. 1. This illustrates the milling of the faces of passenger car journal boxes for the Northwestern Malleable Iron Company's Milwaukee plant. This work is done on a No. 3-B plain machine, and from 1/16 inch to 1/8 inch of stock is removed, the time for each cut being one minute.

At present this concern is using two holding fixtures, one on each side of the table. The cutter is a 10-inch one, with inserted high speed bits, and runs at 38 r.p.m. The table travels at the rate of 6 inches per minute, and owing to the work being made of malleable iron, a soda water solution is used as a lubricant. A glance at the photograph illustrates clearly the nature of



FIG. 1—MILLING THE FACES OF PASSENGER CAR JOURNAL BOXES.

FIG. 2 MILLING THE SADDLES OF THEIR OWN MACHINES.



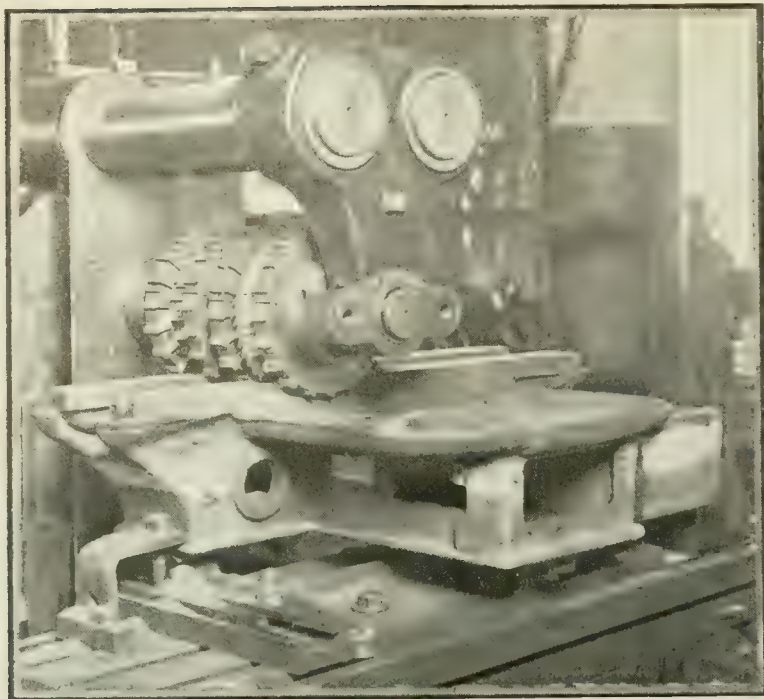


FIG. 3—MILLING THE WAYS OF A GRINDER BED.

the holding fixture, and it will be noted that simplicity has been combined with rigidity in the design of the work holder.

The next example, Fig. 2, is one adopted by themselves for milling the saddles of their own machines. A No. 3-B plain machine is again used, and, as can be noted the proposition is one of straddle milling, in fact a very wide straddle, as the outside cutter is approximately 30 inches away from the face of the column. The writer saw this operation being performed, and the rigidity of the machine was surprising. The double overarm is of course the true secret of the rigidity obtained, and although it is necessary to hold the piece being milled to limits of .001" plus, or minus, no difficulty has been experienced in so doing. It is a point such as

this that makes or mars the success of a milling operation, and it is always safe policy to make sure that your milling arbor is well supported.

#### Gang Milling

We will next consider some examples of gang milling, the first of which is shown at Fig. 3. In this view we see the milling of the ways for grinders made by the Ott Grinder Co., Indianapolis, Ind., and in fact the photograph was taken in the latter mentioned company's plant. A No. 3B plain machine is used, and the six cutters on the arbor are all of the inserted type, the bits being of high speed steel. Both sides and the top of one of the ways are milled, also both sides and groove in the other way. This operation is com-

pleted in one cut, and as can be noted the knee slide is being cut right out of the solid. The method of holding the grinder bed to the miller table is simple, yet very efficient, and it would be a good plan for readers to study each holding fixture carefully as they may later find a chance to adapt the same idea to other classes of work.

At Fig. 4 is shown an interesting example of rack cutting. The rack being cut is made of cast iron, and twenty-one 4-pitch tooth cutters are mounted on the machine arbor. The work is completed in one cut, and the double overarm, plus the arbor support, is largely responsible for the success of this operation. As the Kearney and Trecker Company puts it: "This work was really a test piece made to convince a prospect, and as can be noted the design of the piece did not allow us to use the arm braces. In spite of this the rack was cut from the solid, without the arm braces, and with perfect results."

#### Another Example

Fig. 5 illustrates another example of milling, the work in this case being the milling of square punches. These punches have a 5 degree clearance to enable them to punch railroad tie plates, and five spiral slab cutters are used as shown.

The punches are held in a special five spindle indexing attachment, this fixture turning all five punches the necessary 90 degrees at a time. The work is performed on a No. 3B plain machine for the Whittaker Glaenster Co., Portsmouth, Ohio., and has proved very satisfactory. It will be noted that the five cutters are so arranged that the spiral of each cutter is opposite to the one next to it, this equalizing the torque on the arbor caused by the spiral angle. This is a point to be remembered when using a number of spiral cutters, especially if the cut is rather heavy.

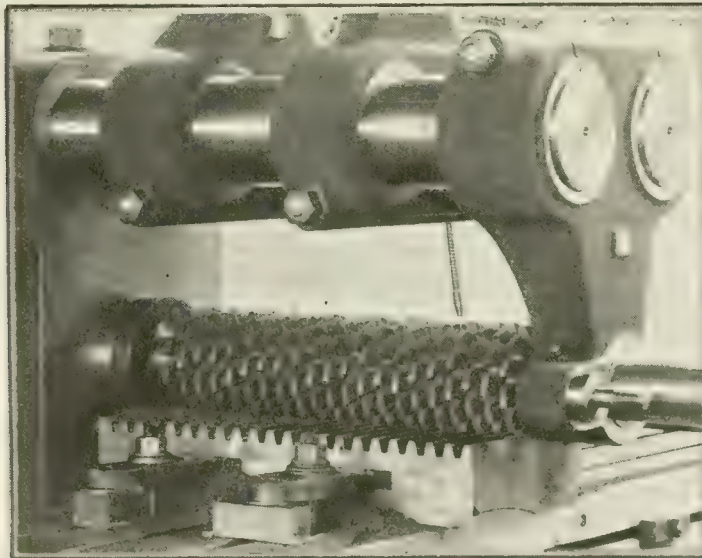


FIG. 4—CUTTING A RACK WITH 21 TEETH AT ONE CUT.

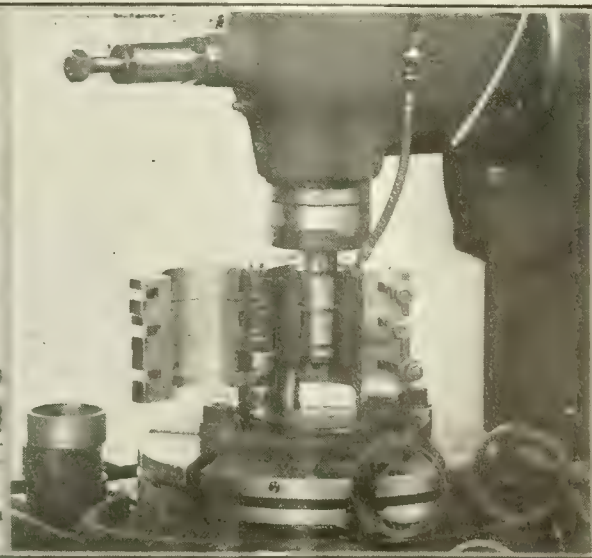


FIG. 7—A GOOD EXAMPLE OF THE VALUE OF VERTICAL MILLING ATTACHMENT.



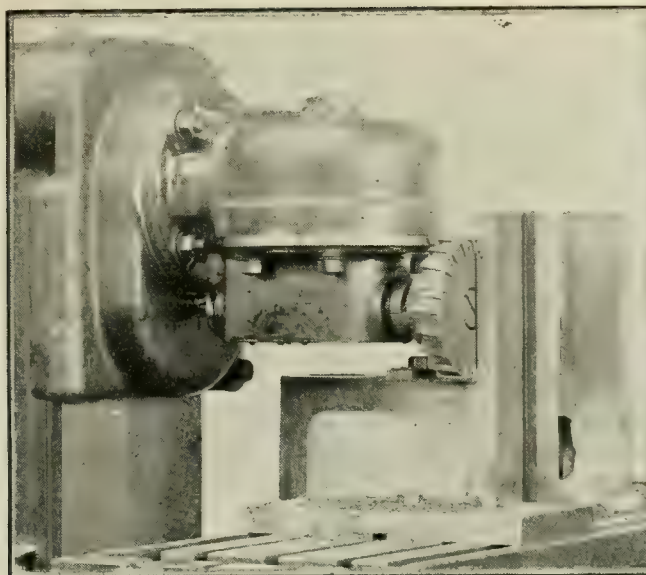


FIG. 6—USING THE UNIVERSAL ATTACHMENT.

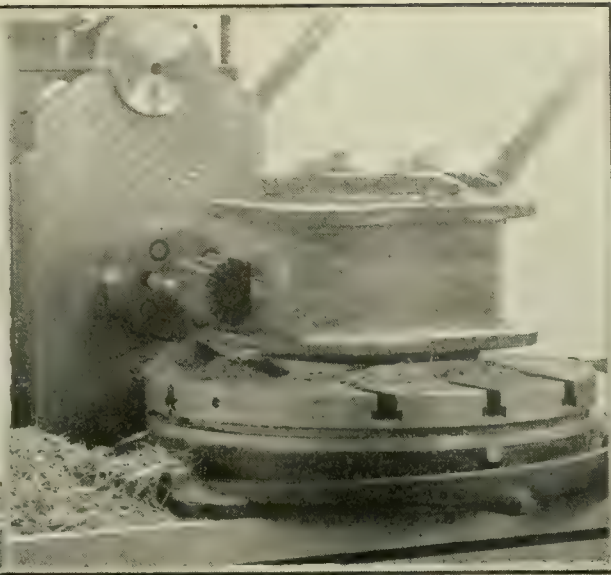


FIG. 8—MILLING LOCOMOTIVE CONNECTING ROD BRASSES.

### Universal Milling Attachment

It is often good policy, in fact it is often necessary, to use some auxiliary attachment in connection with the regular machine to perform the work most efficiently. Such a case is shown at Fig. 6. Here we see a No. 3B plain machine fitted up with the universal milling attachment. The work being performed is the milling of the vertical inside face of the housing which cannot be reached by a cutter on the end of the regular horizontal spindle, the extension on the base of the housing preventing this being done. The next best thing was to use the universal attachment, and as this fixture takes very little time to fasten to the column, it is no detriment whatever. Machinists and toolmakers in general should familiarize themselves with the use of the various attachments, and for this reason we will show further on in the article different applications of such attachments. However, returning to the work shown at Fig. 6. The universal attachment shown can be set at any angle, and can be fastened rigidly in any position, the size of the chips coming from the work in the pres-

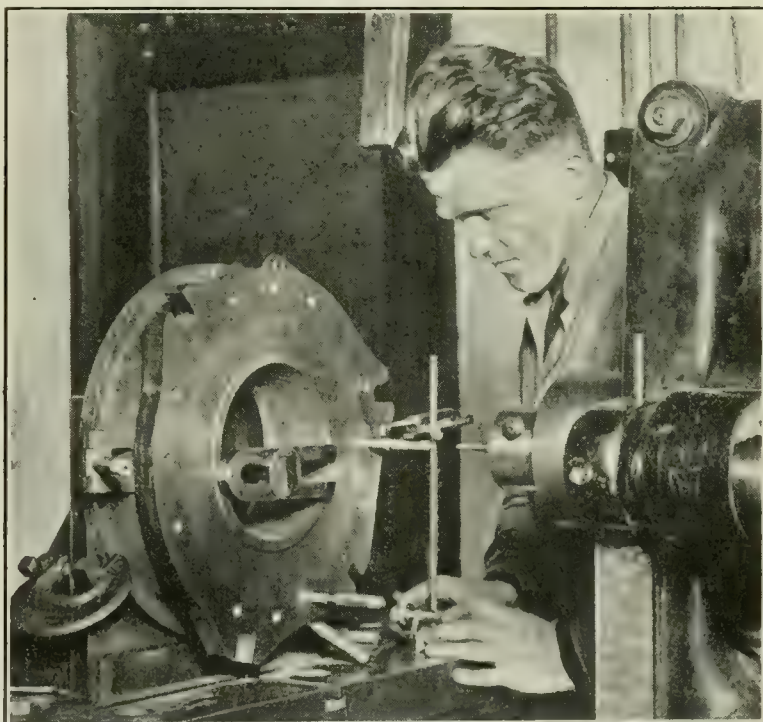
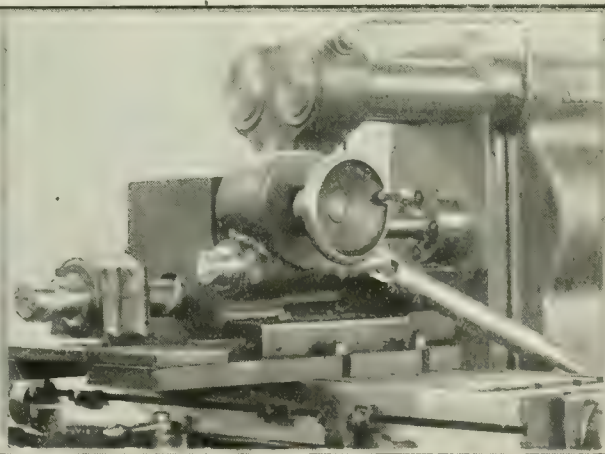
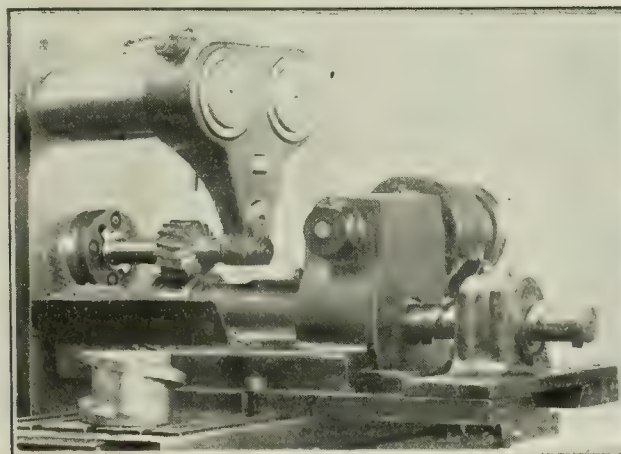


FIG. 11—USING THE MILLER FOR BORING OUT BUSHING HOLES.



FIGS. 9 AND 10.—FRONT AND REAR VIEWS OF A WORM CUTTING ATTACHMENT.



ent example being proof of this statement. There is many a job being done on other machines to-day that could be completed more economically, were the workers more familiar with the uses of milling machine attachments.

At Fig. 7 is depicted a very interesting operation on a No. 1½B plain miller, the vertical spindle attachment being used in this case. The work being performed is the milling of retainer spring grooves in the retainer rings of one of the styles of Hyatt roller bearings. Note the type of holding fixture used for this work. The fixture is attached to the rotary table, which is of course on top of the regular table, and after the three pieces of work are inserted in the holding fixture, the table is fed into the cutters by the table feed until the proper depth is reached. The automatic rotary table feed is now engaged, this giving the work a circular motion. The slitting saws used are 2 inches in diameter and are mounted on a heavy arbor to ensure rigidity. Needless to state absolute rigidity is necessary for work of this nature. The three cutters are 1-16 inch thick, and they cut the three rings in one minute floor to floor time. Samples of the work can be noted resting on the regular miller table.

#### Milling Connecting Rod Brasses

In a previous paragraph in the present article the writer made a statement to the effect that many a job was being performed on other machines that could be better handled on a miller. To prove his assertion let us refer to Fig. 8. This view depicts the milling of locomotive connecting rod brasses on a No. 3B plain machine, the work being mounted on a rotary table that can be indexed at any angle. This allows the machining of the four sides at one set up. Three sides of these brasses are milled square, while an angle is milled on the fourth side for the take up work.

The size of the chips can be clearly noted in the photograph, and the work in this case completed in one hour and five minutes. In a great proportion of

railroad shops this class of work is accomplished on the shaper, and approximately four hours are necessary to complete the job. On the shaper there is a chance of error owing to the different set ups necessary, so that in more ways than one, the miller is the better plan. This is only one case, but it proves conclusively that it pays to study your product, ascertaining if you are completing it in the best manner possible.

#### Cutting Worms

The next two views are especially interesting, a front and rear view being shown. Fig. 9 illustrates the machine as it appears from the front, and in this case the attachment being used is a special worm cutting fixture. This attachment is fitted to a No. 3B universal machine, and a sample of the worm produced can be seen resting on the table. Briefly, here is how the worm is completed. The lead on the worm is obtained through the master screw which can be seen extended toward the front of the miller table. The power is furnished from the feed box to the attachment by a universal feed shaft as shown at right hand lower corner at Fig. 10. The worm itself is 5¼ inches diameter, and a cut of 2½ inches wide and ¼-inch deep is taken in this case. The worm is completed in 25 minutes. Here is an example of careful planning, and shows what really can be accomplished in the line of special fixtures. The attachment was made for the Visayan Refining Co., of the Philippine Islands.

The next three illustrations will depict Kempsmith machines in operation, and the first of these, Fig. 11, shows a rather interesting use for a miller. The work being done is the boring out of bushing holes in a jig plate. As will be noted the work is held on an angle plate, and the operator locates his boring positions by means of the surface gauge. This method of boring is very accurate, and just goes to show that millers can be used for more than mere manufacturing work. The material is cast iron, and we understand that the machine shown has

been in use for the past five or six years.

Fig. 12 shows a No. 2 plain machine milling the slots on a small wringer bracket. The piece is of course held in a suitable jig, and the production obtained on this work is 40 per hour, or 360 per nine-hour day. The material is cast iron, and the depth of cut being taken is ½ inch.

The last example, Fig. 13, depicts the milling of splines on three rocker shafts. These shafts are made from 35-45 carbon O-H steel, and the work is to mill four splines on each shaft. The depth of cut is 1-16 inch, and work is held to limits of plus .003 inch and minus .000 inch. A dividing head is used to index the work, and the three dead centers can be clearly noted on the photograph.

Having thus led up from the very simple holding fixture to the more complex, we will leave the subject for the present, but will take up, in a later issue, still further examples of milling fixtures, some of these being of the continuous milling type.

#### PENETRATION IN CASEHARDENING

In ordinary practice it is stated to be useful to include with the articles to be casehardened one or more standard mild-steel test-pieces. These, with all the other articles included in the charge of the pot, are subjected to the casehardening action; the degree to which this action has gone is judged by inspection of the fracture of these test specimens. So claim J. Galibourg and M. Ballay in the Institute C.E. Foreign Abstracts. The authors claim that the naked fracture of such specimens, whether unquenched or reheated and quenched, is deceiving; they therefore treat the fractured surface with a solution containing copper sulphate, the effect of which is to deposit copper differently on the carburised sections; this differential disposition is independent of whether the specimen is hardened or not; and it makes the evaluation of the depth of carburisation more exact.

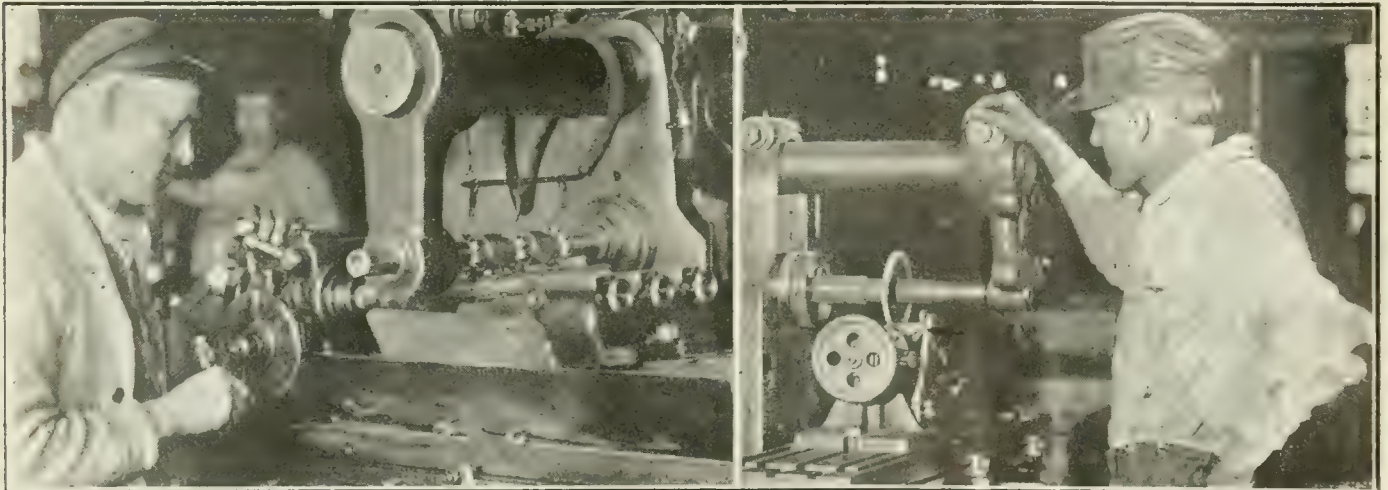


FIG. 12—MILLING SLOTS ON SMALL WRINGER BRACKET. FIG. 13—MILLING SPLINES ON THREE ROCKER SHAFTS AT ONE TIME.



# Producing Graduated Dials Economically

Moderate Quantities Can be Produced Without Expensive Equipment—Automatic Screw Work—Knurling on Lathe, Reaming And Stamping Operations are Involved

By F. SCRIBER

THE making of dials in moderate quantities, accurate and at a reasonable cost, is apt to be rather a difficult proposition where suitable equipment is not at hand. In view of the fact that these are being used more extensively at present than in times past on all types of machinery, it is believed that the accompanying illustrations, which show a method of making a graduated dial without the aid of expensive equipment, will be of interest.

Fig. 1 is an illustration of a graduated dial that is to be machined, and shows the general proportions of this design. The dial is made of high-grade screw stock which is drilled out and finished all over. The first operations are performed on an automatic screw machine, the tools used in setting up the machine being shown in Fig. 2. Bar stock is used in this set up and is gripped in the revolving chuck on the machine. The various functions performed on the work are, first, spot drill; second, turn 1 7-16 inch and 1 5-16 inch diameters, at the same time drilling out the large holes. Third, ream the large hole, square the bottom of hole and chamfer; four, drill the small hole, turn the diameter at short end, form chamfer and cut off. Fifth, complete cutting off. Tools used are indicated over the various diagrams designated as first spindle, second spindle, etc., on drawing, Fig. 2, where it will be noticed that A is a short spotting drill held in a holder H. C is the tool used for turning the 1 7-16 inch diameter. Tool D is used for turning the 1 5-16 inch diameter, while drill E opens up the large hole. These are all contained in a box form tool F, which has adjustable shoes G and H for supporting the work while being turned. The split bushing I holds the drill in place, square-headed screw J being used for tightening. Over the diagram "third spindle" the reamer K is used for finishing the large hole. This reamer has one tooth cut across its end which is used to square the bottom of the hole leaving it slightly bevelled at the corner. A cutter L, held in a holder M, by screw N, is used to chamfer the end of the work.

Referring to the illustration over diagram "fourth spindle" the drill P opens up the small hole. This is held by bushing Q, in holder R, by means of set screw S, the bushing Q being split so it will securely grip the drill. Attached to the cross-slide of the machine by a suitable block is a formed cutter T. This turns the short length, chamfers

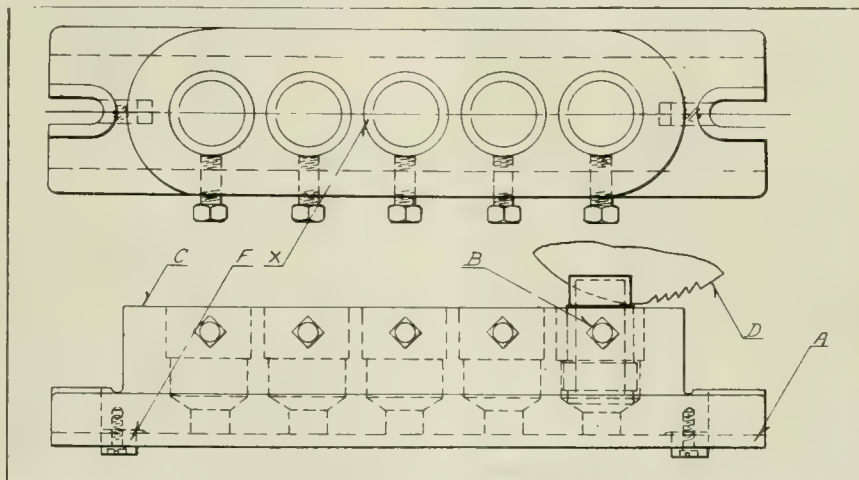


FIG. 3—FIXTURE IN WHICH SLOTS ARE MILLED.

the long bevel, and partly cuts off, while on the rear cross-slide of the machine the cutting-off tool U is mounted in a suitable holder W. This series of tools is arranged so as to permit the operations to be performed in the least amount of time consistent with a good quality of work.

It will be noted by referring to the first illustration that there is a slot across the end of the dial. This is milled by using a metal slitting saw. The object of this slot is to permit a split collar to clamp the dial in place on the machine. The fixture employed is shown by Fig. 3, and the manner of using it is quite obvious. A bushing A, or a series of bushings, one for each hole, of which there are five, are slipped over the 1 7-16 inch diameter of

the work. The work is then located in the holes as shown, and the bushing which has previously been slipped over is clamped by a square-headed set screw B. Five parts are held simultaneously in the fixture, the body of which is indicated as C, this being made of cast iron. The bushing A, previously mentioned, is split at X and is made of tool steel hardened and tempered so it will spring together slightly and clamp the work. D indicates a section of a cutter, and the arrow shows the direction of rotation as it is fed into the work.

Another feature is that a slot E is cut under the lower side of the fixture. Into this slot the various clearance holes are drilled from the holes in which the pieces rest. This permits the

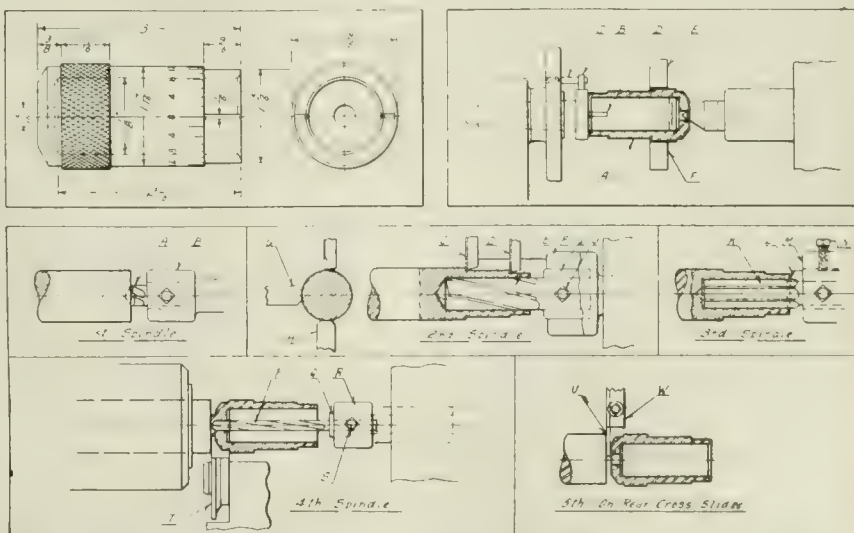


FIG. 1—UPPER LEFT VIEW. DETAIL OF THE PART.  
FIG. 4—UPPER RIGHT VIEW. HOLDING ARBOR FOR KNURLING AND POLISHING.  
FIG. 2—BALANCE OF VIEWS, SHOWING THE 5 SPINDLES USED IN DRILLING AND FORMING DIAL.



chips to fall through into the slot, after which they can be readily blown out by an air tube. Tongues are set into the fixtures and locate the same in the tee slot of the machine, all of which makes a very economical arrangement. Another operation which still has to be performed on this piece is that of knurling and this is very easily accomplished on a lathe using the tools shown in Fig. 4.

This consists of an arbor A which fits the spindle of the lathe. The arbor N has a pin B in it which comes in contact with a driving pin held in the face plate of the lathe. This causes the arbor to revolve under the strain of knurling so there will be no slippage. The tailstock of lathe is fitted with a spindle which can be quickly pulled back to remove the work, being operated by a lever with a spring arrangement. The work is slipped over the arbor into the position shown and the slot previously milled fits over a pin D which drives the work. The spindle knurl holder, having left and right-hand knurls, E and F, is fed across the work in the usual manner. It is next desirable to polish the dial, which is accomplished with a file and emery cloth on a speed lathe using a similar arbor, except that driving pins are omitted.

Referring to Fig. 1 it will be noted that the 1 7-16 inch diameter has numerals marked on it and indicating lines cut in its surface. In order to conform this surface and make all parts exactly the same size after filing and polishing, it was found desirable to compress it slightly in dies such as are shown in Fig. 5, where A and B are hardened steel plates with a very glossy surface which conforms to the diameter desired. C is the die holder which is clamped to the bed of the punch press. The dies are held to the holders by screws and dowels, and two guide pins E and F hold the two in alignment while the operation is performed. This die is constructed so that it will close the split end slightly. Next come two reaming operations. These are very economically performed in bench fixtures as there was hardly enough pieces machined at one time to warrant elaborate fixtures. The jig at Fig. 6 is for cutting the graduated lines on the periphery of the 1 7-16 inch diameter. The base of the fixture A is made of cast iron and has a plate B mounted on it, which is made in part with a hub to fit the hole in the base at C. This plate has a number of holes in it which correspond to the number of lines that are to be cut on the periphery of the dial. A plunger D enters these holes, spring E being used to force the plunger up. A pin F, which is pushed down by the operator, causes the spring to contract when it is desired to turn the plate from one hole to the other. Mounted in this plate is a stud G which

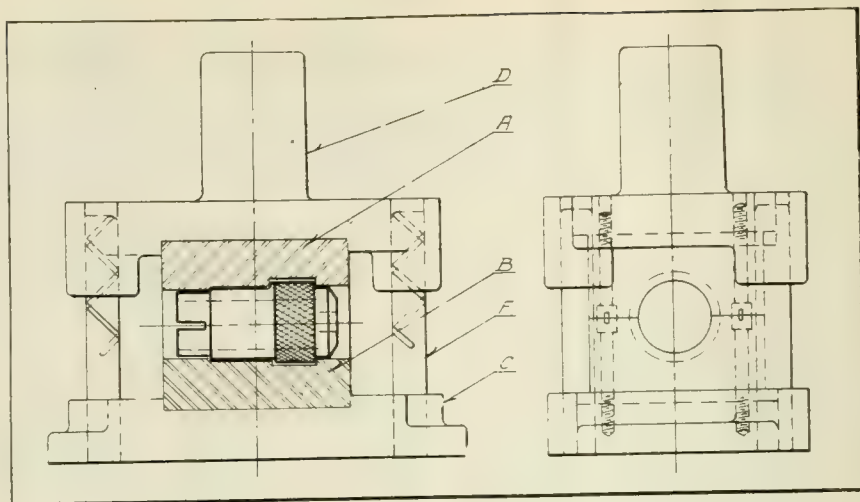


FIG. 5—PUNCH AND DIE FOR CONFORMING DIAL DIAMETER.

is held by a collar H threaded on its end. This collar likewise keeps the plate B in the base of the fixture. The dials X are slipped over this plug G, the end of the plug being relieved and split. At I a tapered screw, having a square end J on it, expands the end of the stud, causing it to grip in the hole of the dial.

With the work thus clamped it is a simple matter to adjust the cutter K by means of the screw L so it will cut a line of the desired depth in the dial or work. To perform this operation the cutter is mounted in a slide M, the lever N being employed to move this slide up, its own weight, of course, keeping it down into the position shown. This lever has a screw P which comes against a pin Q, and the action of lifting the lever up causes the slide to be pulled up, thus cutting a line the required length on the periphery of the dial.

Graduated lines are cut on the body

of the fixture and on the slide as indicated by arrows, and these lines match at either position as desired for either long or short lines, this governing the length of the same. The slide is of the square type held in place by straps R at both sides. After one line is cut, the operator pushes down pin F, indexes plate B to the next hole, cuts the second line, and follows this procedure until all lines are cut. Long or short lines are cut at each hole on the plate to indicate to the operator whether he is to pull the slide up to the indication mark for a long or short line on the slide. The starting point is also indicated on the indexing plate to guide against the cutting of one line twice which might possibly result in spoiled work.

The fixture Fig. 7 is used for stamping the numbers on the periphery of the dial. This fixture is constructed of cast iron, having a base A in which is mounted a stud B somewhat similar to that used in the preceding fixture, this stud is split at C and is expanded by the screw D to clamp inside of the dial. This is made so that the dial may readily slip on without removal of any parts. A spring pin E having a beveled top engages slots cut in the periphery of a dial F; these correspond to the number and lines on the work. A pin Z, not previously mentioned, is used in both this and the former fixtures to locate the dial radially, and hand wheel G is used for turning the arbor B, while the pin H is made to fit the outer 1 7-16 inch diameter of the work. In using the fixture the operator takes a steel stamp I which fits a slot in the body of the fixture, and holding it in the position shown, strikes it a blow at X, thus causing an impression of the number at the opposite end to be stamped in the work. He then turns the hand wheel G until pin E engages dial F at the next cut. After placing the next number in position he hits that with a hammer, likewise making the impression of the number on the dial. This is continued until all the numbers

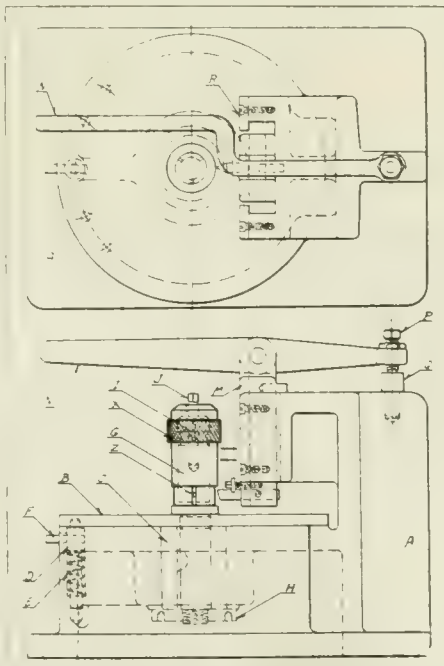


FIG. 6—FIXTURE FOR CUTTING INDICATING LINES.



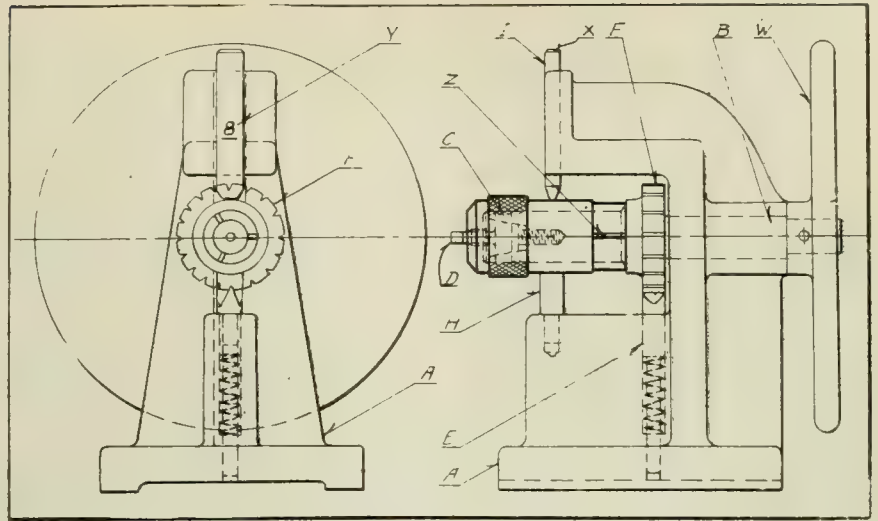
are stamped in place. In this connection it should be noted that numbers are stamped on the hand wheel at W and also at Y on the stamps, and when a number is up at W the number on the stamp must correspond, thus guiding against errors in the marking.

As it is not necessary to maintain the same accuracy in numbering that is desirable when cutting the lines, a much smaller indexing dial is used on the marking fixture than that which is employed on the line-cutting fixture. While this equipment, with the exception of the screw machine tools, cannot be termed speedy operating, they are of the type which makes for a good degree of accuracy, and a fair amount of economy on repeat work required in small lots, such as used in machine building. They are, of course, of the type which are used by many manufacturers in building up a business before reaching the point where they can specialize on a few things of the large quantity type.

### DRILL JIG WITH PILOT BUSH IN BASE

By G. BLAKE

The accompanying drawings illustrate a method of boring cored holes with the pilot bush in the base of the jig instead of in the top portion. The usual practice in jig drilling is to have the guide or pilot bush on the top side of the jig, with the drill or boring bar entering therein. In the case of cored holes it is often very difficult to prevent the drill from following the rough hole, even though it is well supported by the bushing. The work here shown is that of an aluminum brake shoe for an automo-

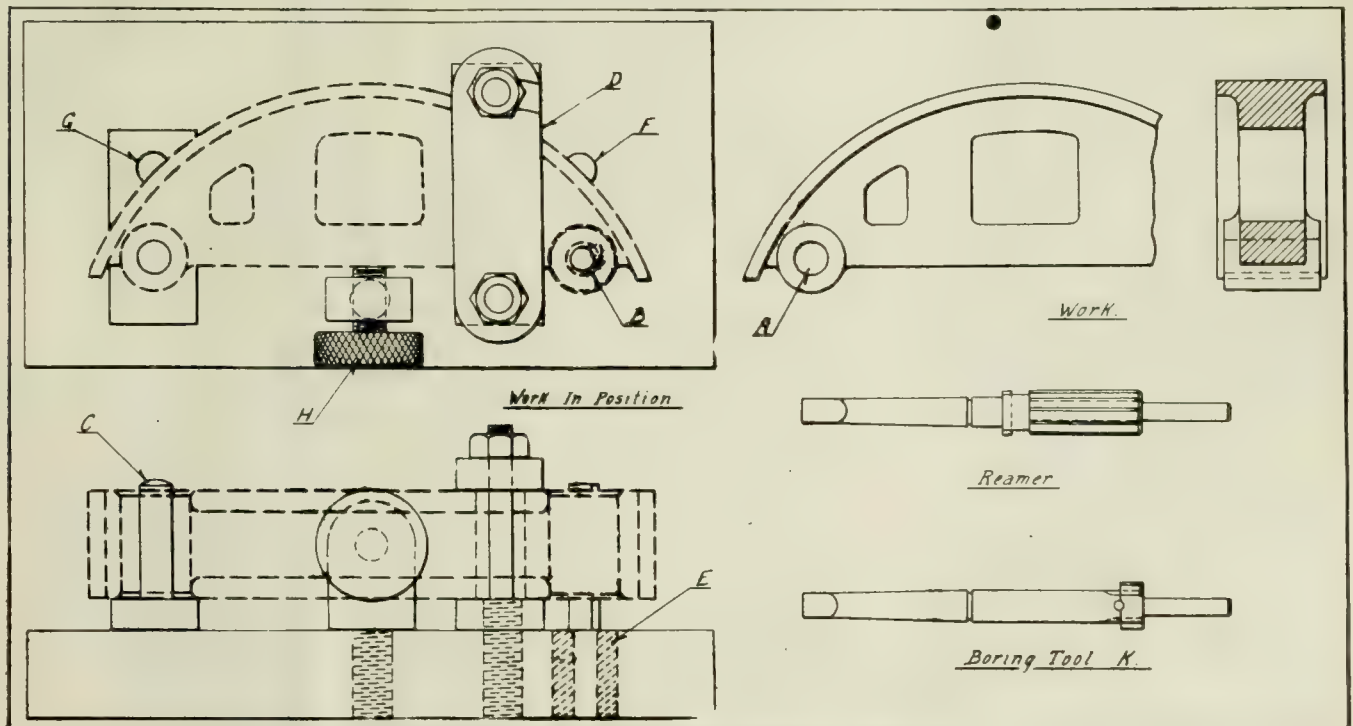


FIXTURE IN WHICH THE NUMBERING IS DONE.

bile. The hole A is first laid off and drilled and reamed without the use of a jig. B is the cored hole to be bored. After the hole A has been finished the shoe is placed in position as indicated, locating from the finished hole A on the stud C, and clamped down by the swinging clamp D. The boring bar K, with the pilot on the end, is fed down, the pilot passing through the cored hole and entering the guide bush E in the base of the jig. The jig is simply a cast iron plate machined on the base and provided with raised strips on the upper surface for locating the work, allowing about  $\frac{1}{2}$  inch between the bottom of the shoe and the top of the guide bushing, this space being necessary to avoid any possibility of the cutter coming in contact with the hardened bush, after the hole has been bored. The thrust screw H locates the work in position against the stop pins

F and G. One of the chief advantages of this type of jig is that the operator can see the boring of the hole as it is in process. The finished size of the hole in this particular instance is  $1\frac{1}{8}$  inches, the cored hole being about one inch in diameter. A  $1\frac{1}{8}$  inch twist drill is used to rough out the hole before using the boring bar. A shell reamer on a floating arbor is used for finishing the hole to size. The boring bar pilot is provided with a helical groove for lubricating purposes; it is likewise case-hardened.

R. J. Barrie, of Galt, Ont., has purchased the Wragg Pattern Works of the same city. This plant is said to be particularly well equipped, and the present owner was previously one of the master craftsmen engaged by the former owners.



THIS SHOWS THE WORK, ALSO DETAILS OF THE JIG.



# Novel Method of Making a Surface Plate

By T. Kenney

**M**ANY small and medium sized shops are admirably equipped with various types and styles of measuring instruments, gauges and fine tools of all kinds, but very few indeed can boast of having a first-class surface plate, one that can be absolutely relied upon, and without which it is impossible to measure with any degree of accuracy some of the complicated pieces of mechanism, jigs, fixtures, etc.

Before proceeding on how to make one perhaps a few words along historical lines may be of interest, and probably news to a good many of the younger mechanics. About 1830 the late Sir Joseph Whitworth, the eminent English engineer, was working in London, England, for a man by the name of Henry Maudslay, and he had to produce a perfectly true plane. Needless to say, it does not require an extraordinary amount of imagination to realize what a difficult task he had before him, especially when one bears in mind that the variety of machine tools were, at that time, limited. He had no standard or true plane with which to test his work when finished, or even to help him in making the one he had in hand. However, he came to the conclusion that in order to generate a true plane, and to be absolutely sure that he had produced one it would be necessary to produce three. This he was successful in doing, but not before a lot of thinking, and probably much more hard work. So far as the writer knows, there is no record of how long he was in producing these three true planes, but many years afterwards, in 1840 to be correct, Sir Joseph read a paper on the preparation and value of a true plane at a meeting of the British Association, and at that time pointed out that it depended upon the principle that, if any two of three surfaces exactly fit each other all three must fit, and consequently all three must be true planes and flat. Such great accuracy of workmanship was far ahead of what was contemplated at that time as possible in mechanical engineering, but Whitworth proved that it could not only be attained in practice, but also showed that it could be measured—truly a remarkable achievement at that period.

Coming to the present article. It will be seen upon referring to Fig. 1, which represents the three plates marked A, B and C that if A and B fit exactly, even though they are slightly curved, that is, A is convex and B concave (exaggerated in the diagram), B cannot possibly fit C, but would look as shown. By scraping each one and fitting first A to B, then B to C, and C to A, and repeating the operation time after time, a true

plane in each case will be the ultimate result. When? That is, how far has this scraping to be carried before a practical, yet true, plane is in such condition as to say it is now OK. The writer, who has produced several, generally strives to have the finish markings and contact points not more than one-eighth of an inch apart at any place, in some cases less. Needless to say, the marking medium must be a mere suggestion for the finishing cut with the scraper, and after carefully cleaning the plate, then trying same with one or other of the plates already very slightly smeared with prussian blue or lamp-black, the result should look like that shown in Fig. 2. You can then be sure of having a first-class and practically perfect surface plate.

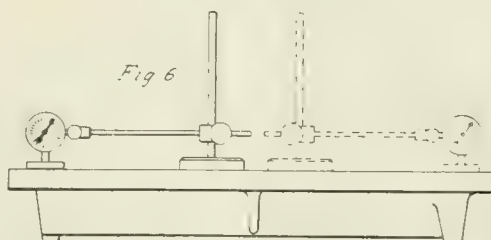
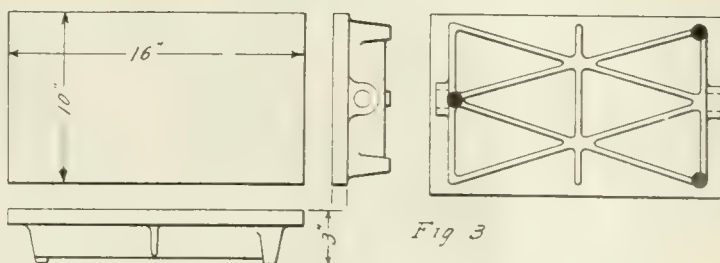
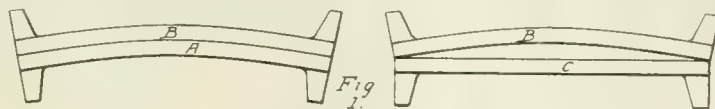
## Question of Design

A good many designs are employed, but it is now universally conceded that a well ribbed plate having three feet, that is, a three point bearing, is the best in most cases, inasmuch as three feet are always in contact with the bench, whereas four feet are seldom all on the bench, the four point bearing making this condition practically impossible. This is an important point to remember, as it is a known fact that cast iron continues to work, be it ever so little, for a long time, therefore it will be readily

seen that if the plate has four feet instead of three, one of the feet may be suspended in the air, as it were, for several days or weeks at a time. The stresses set up by this overhang would be the means of bringing about abnormal and troublesome warping, which may result in a permanent set, thus impairing the plate's accuracy. In such a case some day, someone might get badly fooled, and there would be no alternative but to rescrape the plate to a good standard before it could again be thoroughly relied upon.

## Size of Plate

A good size of plate for the average small shop is 10 inches wide and 16 inches long, or if one desires a larger or smaller one the same proportions will be found to be excellent, that is, the sides in the ratio of 5 to 8. Fig. 3 shows a plate of good general design which can be thoroughly depended upon in practice. It will be seen that the webbing is about the same thickness as the top, the sections being slightly tapered for drawing from the sand. This reduces the possibilities of unequal stresses. Some makers prefer to make the webs half the thickness as the top, and while this makes the plate lighter, the writer believes it sets up unequal stresses. As shown in Fig. 3 the depth of the webs from the top of the plate, for a plate



FIGS. 1, 2, 3, AND 6. REFER TO TEXT MATTER FOR EXPLANATION.



of the dimensions given, should not be less than 3 inches to insure rigidity.

After having made the pattern, a casting of good grade iron should be secured, not too hard, but of a close grain. Previous to machining these should be very thoroughly peened all over to relieve internal stresses. This precaution against subsequent warping is well worth the time and adds very materially to the length of life and accuracy of the finished plate. The three plates are now ready for machining on the feet, top and sides, after which they can be set on one side for several months, or used as rough marking off plates, provided they are not ill used. After a lapse of from six to nine months they can be again machined all over, taking great care to have the sides as nearly square as possible. The top is now given a finishing cut, which is done with a shaving tool



Fig. 4.

used will not be amiss. The writer has seen a variety of these, some very handsome tools indeed, but that is all. A first-class practical tool can be quickly made out of an 8 inch flat file, with about one inch of the tip broken off. It is first ground to eliminate the teeth, then flattened to about 1-32 of an inch, and re-ground to shape, and about 1 inch wide, similar to that shown in Fig. 5. It is then hardened dead hard, taking care not to burn the thin cutting edge during the heating. It should be oil-stoned with the cutting edges square with the faces, and finally finished on an Arkansas stone. You will find that this scraper will actually cut, and not scratch.

When on the finishing cut of the plates have the scraper in the keenest condition and merely pick off, as it were, the marked portions, taking care to use just

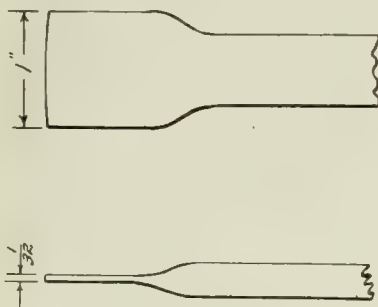


Fig. 5.

FIGS. 4 AND 5.—SHOWING THE TOOLS USED.

shown in Fig. 4. This is a very old-fashioned tool, but a good one nevertheless, and the writer can strongly recommend it as one of the best where a first-class finish is desired. The twist of the cutting edge is about 15 degrees, and the cutting edge is slightly convexed. It should be tempered to a dark straw, then carefully ground and stoned, producing a very keen and even cutting edge. If this tool is nicely made and care taken in stoning, practically no wear takes place, as the action of the tool is one of shaving rather than actually cutting, whilst the finish is superb.

After the finishing cut the plates are marked, A, B and C, and one, usually the one that appears to have the best face, say B, should be smeared with prussian blue or lampblack. This marking medium should be spread evenly upon its face, then the plate is rubbed with a circular motion with its face on, say, plate A. In the early stages this testing of one plate on another need not be of long duration, as the plates will be found to be far from flat, and much roughing down with the scraper will be necessary before one can settle down to the real job. The three plates are worked alternately, always carefully cleaning the one scraped. By using turpentine the scraping will be found to be much easier.

A suggestion or two on the scraper

about the same strength of cut at all times during the operation. If the cuts are taken first in one direction and then in another much better results will be obtained. It is a heavy, tedious job, but when finished such a plate is a pleasure to work over and it can truly be classed among the gauges.

A good method for testing the surface against any subsequent warping is shown in Fig. 6. A lapped test block of small area is placed at one corner, then a surface gauge, carrying a test indicator is placed about the centre of the plate with the test indicator registering, .005 on the test block. The test block is then moved to another corner and the reading of the indicator should be the same, and so on for the four corners. After this different places on the plate's surface can be tried in the same manner, and if no appreciable difference is shown on the indicator, one can rest assured that the plate has not "moved" to any serious degree. If, however, you can borrow a standard plate, known to be in good condition, it will not be necessary to make three plates, as the one in hand could be scraped and tested by this, although way back in the thirties there was no such thing as getting the loan of a plate, or even reading of the method employed in producing a true plane.

## HEATING DROP FORGE DIES

A rather interesting patented method of heating drop forging dies is spoken of in a recent issue of the "American Drop Forger." This idea is patented by H. R. Reinhardt, and here is what he has to say:

"My method is to increase the life of drop forge dies by keeping them during use at a temperature considerably above atmospheric and somewhat below the hardening temperature of the die. In general, the temperature at which the tools or dies are to be kept during periods of active use varies from 300 degrees to 1,100 degrees F., depending on the characteristics of the steel or alloy of which the die or tool is made. Dies of ordinary carbon steel, containing from .75 to .90 per cent. carbon, should be kept at a temperature of 400 degrees to 500 degrees F. For this material, the lighter the dropping-weight of the machine in which the die is used, or the lighter the stock of which the forging is to be produced, the lower the temperature at which the die should be kept. A high-speed tungsten-steel die containing, say, 16 per cent. tungsten, 3.4 per cent. chromium, .8 per cent. vanadium, and .65 per cent. carbon, should have a working temperature of 1,100 degrees F. A steel containing 2 per cent. tungsten, 1 per cent. chromium, .80 per cent. silicon, and .45 per cent. carbon, which is much used for dies for hydraulic bulldozing and compression work, as well as hot-trimming and blanking, should have a working temperature of 500 degrees F. A die for hot-trimming, drop-forging, and hot or cold bolt-heading, made of steel containing .90 per cent. carbon, .40 per cent. manganese, 3.50 per cent. chromium, and .20 per cent. silicon, should have a working temperature of 750 degrees F.

There are various ways by which this heating of the dies may be accomplished. The tool may be surrounded with a jacket packed with infusorial earth or with fine molding sand, the whole apparatus being heated with gas-burners. Where the required temperature is relatively low, a bath of oil, lead, or lead-and-tin alloy may be used. By varying the proportions of lead and tin in the alloy, almost any melting-point between 400 degrees and 600 degrees F. may be obtained, thus furnishing a simple method of attaining and maintaining the proper temperature.

## CUTTING SOFT METALS

In cutting copper, tin, lead, or, in fact, any soft metal, it is good policy to see that a small amount of water is kept in the cut already made. If this is done it will be found that the metal separates easier and the edge of the saw keeps in good condition longer than when dry cutting is done. Even an ordinary chipping chisel does better work when the edge is kept wet than when it is dry.



# Present Day Illumination Standards

Artificial Lighting Now Considered an Asset Rather Than a Liability—Careful Placing of Machines Necessary if Artificial Lighting is to Accomplish Its Purpose

\*By GEORGE C. COUSINS

**I**N planning the layout of machinery in factories the relative importance of daylight and artificial light is frequently not given sufficient study, with the result that machines are placed so as to utilize daylight under best conditions. This arrangement often complicates utilization of artificial light to the best advantage. Daylight has usually been considered satisfactory and has been used as a reference standard in the absence of real data on the actual conditions.

Surveys of daylight illumination in factories have revealed the fact that in many plants the natural illumination is inferior to good artificial lighting. The following is a typical example: A machine shop is built with practically continuous window area on south, west and north walls. On a clear cloudless morning measurements of intensities at the benches near the windows showed over 50 foot candles (ft.-c.), while about 30 feet from the windows the intensities at the work points of machine tools ranged from 3 to 14 ft. c. In some cases artificial light was used to supplement the daylight. The shop under consideration was on the second floor of the building, there were no high buildings within several hundred feet and a clear sky exposure is obtained on all sides. This is a very favorable condition. Where buildings are grouped together so that the sky is obscured the conditions would be very much worse. A more extended study of daylight intensities in 18 factories showed average intensities ranging from 1.5 to 10 ft. c. for lower grades of work and 4 to 18 for finer grades.

These results tend to show that daylight illumination in factories is not as good as is ordinarily supposed to be the case and that the distribution of daylight is far inferior to that of reasonably good artificial lighting. As a result of the knowledge of these conditions it has been proved that artificial lighting can be economically produced that is superior to daylight in both average intensity and distribution, and that when the lighting system and the machinery or work spaces are properly co-ordinated, the resulting illumination will have the greatest all-day effectiveness and manufacturing can be maintained on a really productive basis throughout the entire day.

For many years the conviction of illuminating engineers has been that factory output could be increased by the use of high intensities of illumination, but the putting of this opinion to the test was a difficult problem and it re-

quired some strong action to break the ice of opposition.

## A Convincing Test of Better Lighting

The problem was attacked in a rather novel manner by the Commonwealth Edison Co. of Chicago. Their engineers approached a number of manufacturers, at whose plants accurate cost records were kept, with the proposal to install trial lighting systems to produce three times the intensities previously recommended for the various classes of work. Records of cost and output were to be kept for a month under the existing lighting systems, then for a month under the new and finally a reversion to the old systems for another month. This was expected to furnish reliable data on the unit cost of output. The results were so gratifying that all the trial systems were retained as permanent, and in some cases the manufacturers would not per-

## POINTS OF INTEREST

*Proper artificial lighting is essential, if productive night work is to be obtained.*

*Watch the relative importance of daylight and artificial light. Study both conditions.*

*Artificial lighting can be produced economically, at the same time making it superior to daylight if properly distributed.*

*Increase in both production and pay roll is possible if light is of sufficient intensity.*

*Artificial light is used on an average of 5 hours per day throughout the year. In view of this figure, the subject requires proper attention.*

mit a reversion to the old systems, realizing that it would mean financial loss. Some of the effects of the high intensities were that the increase in production was from 10 to 20 per cent., with a maximum cost increase of 5.5 per cent. of the payroll. In one case the production was increased 15 per cent., with no increase in the cost. The increased economy is due to more work being turned out with a decrease in the amount of spoiled and defective work. The indirect beneficial results to the workers in the form of more cheerful surroundings, cleaner shops, less eye strain and fewer accidents react to the benefit of the manufacturer in keeping the working force in a more efficient and contented mood.

A very important phase of the effects of high intensity is its effect on the

accident rate. About ten years ago approximately 24 per cent. of industrial accidents were caused by poor lighting, by improving the lighting conditions this percentage has been reduced to about 15 per cent. The economic loss caused by these accidents amounts to approximately \$300,000,000 per year in the United States, which is more than the yearly lighting bill.

The relative importance of daylight and artificial light may be estimated from the fact that artificial light is used on an average of about five hours per day throughout the year. This is roughly about 50 per cent. of the working day and in view of this the importance of giving proper weight to artificial lighting is evident. When plants are operated at night the balance is overwhelmingly in favor of artificial light.

Here are some figures showing the intensity recommended for different kinds of work. These figures are stated in foot-candles. Shipping rooms, 1.5 to 2.5; paint shop, 2.0 to 4.0 for coarse work and 4.0 to 8.0 for fine work; passageways, .25 to .5; metal pattern dept., 4.0 to 6.0; power house boiler room, .8 to 1.5; engine room, 2.0 to 3.5; sheet metal dept., 3.0 to 6.0; average factory—assembly 4.0 to 7.0, drills 2.0 to 4.0, millers 3.0 to 6.0, planers 3.0 to 5.0, rough manufacturing 1.25 to 3.0, fine manufacturing 3.5 to 6.0, special cases of fine work 10.0 to 15.0; forge and blacksmithing—ordinary anvil work 2.0 to 4.0, machine forging 2.0 to 3.0, tempering 2.0 to 4.0, tool forging 3.0 to 5.0; foundry—bench moulding 1.0 to 3.0, floor moulding 1.0 to 2.0.

Stairways, 0.25 to 0.5; steel work—blast furnace (cast house) 0.3 to 0.5, loading yards (inspection) 0.3 to 0.5, mould, skull cracker and ore yards 0.1 to 0.3, open hearth floors (soaking pits and cast house) 0.1 to 0.3, rolling mills 1.0 to 2.0, stamping and punching sheet metal 2.0 to 5.0, stock room 0.8 to 2.0, transfer and storage bays 0.5 to 1.0, unloading yards 0.1 to 0.3, warehouse 0.5 to 1.0; stock rooms—rough materials 1.0 to 3.0, fine materials 2.0 to 4.0; storage, 0.25 to 0.5; wire drawing—coarse 2.0 to 4.0, fence machines 2.0 to 5.0, fine 4.0 to 8.0; woodworking—rough 2.0 to 4.0; fine 3.0 to 5.0.

## Revised Estimates

The figures given show the intensities recommended for various classes of work in 1916. A reference to a few of these might be interesting for the sake of comparison. Machine tools were listed as requiring from 2 to 6 ft. c., rough manufacturing 1.25 to 3, fine manufac-

\*Abstract of paper presented at the general professional meeting of the E. I. of Canada at Toronto.



turing 3.5 to 6, special cases of fine work 10 to 15, drafting 7. Compare these with some of the recent installations; for an aluminum working plant 14 ft. c., a drawn steel factory 15 to 16 ft. c., manufacturing automobile springs 21 to 22, ordinary machine shop work 10 to 11 and punch presses 6 to 10. These cases do not require particularly fine work and yet the intensities are equal to or greater than daylight intensities in many factories.

As far as can be learned all the installations of high intensities have resulted in economy and are considered good investments. How far high intensity can be carried before the limit of economy is reached is problematical, but that limit has not yet been reached. It appears evident, however, that as intensities are increased the increase in economy will be by smaller increments and that the gain resulting from an increase in intensity of from 10 to 15 ft. c. would not be as great as it would from 5 to 10.

Considerable headway is being made in the elimination of drop cords. In some cases workers have clung so tenaciously to these that their removal has resulted in mutiny. In some operations they are indispensable, and to provide for such contingencies in up-to-date plants they are kept in tool check rooms and supplied as special tools being returned when the operation requiring them is completed. Experience has proved that there are very few industries that cannot be lighted quite satisfactorily by overhead units. Drop cords are relics of the early days, when carbon lamps were the only suitable electric lamps for interior lighting, and should find no place in modern installations of high-powered lamps in suitably selected and placed reflectors except in special cases where overhead light cannot reach the point where work is being done. The practical solution of the elimination of drop cords is the correct placing of lamps relative to the work places or vice-versa. In large plans of mill construction it is sometimes necessary to provide individual lamps for machine tools placed in open bays. In some cases flood lighting units placed close to the ceiling are suitable and for others an adjustable lamp with its reflector is mounted on the end of a pipe arm which can be adjusted horizontally through an unthreaded T, which can in turn be raised or lowered on the end of a telescoping upright. By this means a substantial construction is provided without the dangers accompanying exposed insulated wire.

#### Office Lighting

On account of the connection of offices with factories some of the improvement in the lighting of the latter has extended to the former. Office work as a rule does not require as high intensity as factory work, but requires more refinement in the form of diffusion. One of

the important factors in the success of office lighting is the elimination of bright reflections from furniture and paper surfaces. This has been very successfully accomplished by the use of semi-indirect and indirect fixtures. It has been found that the eye suffers less fatigue under indirect than under any other type of fixture. The dense bowl semi-indirect unit gives practically the same illumination effect and the more dense the bowl the less eye fatigue is caused. Considerable improvement has been made in the design of semi-indirect bowls during the last few years. These are mainly in the way of dust proof units. Totally enclosing units can now be obtained that have all the good qualities of the open inverted bowls with the dust proof feature of enclosing globes. Some of these have reflecting domes above the bowls for use where ceilings are not suitable for use as secondary light sources and others have clear glass tops. Other fixtures are equipped with automatic cleaning devices operated by the same pull-chain that operates the switch. Every time the lamp is lighted or extinguished a felt squeegee makes a complete revolution of the interior of the bowl, removing all dust. About 5 to 10 ft. c. might be considered as representative of good office lighting at present, although there are some installations of from 14 to 19 ft. c.

The period of transition from daylight to darkness when the fading daylight must be reinforced by artificial light has always been one of the difficult problems to solve. During this period the eye is attempting to work under two conflicting conditions. It is adapted to the color of daylight and the introduction of the yellower artificial light disturbs its condition of equilibrium; comfortable vision is not obtained until artificial light dominates the situation and the eye becomes adapted. To reduce the annoyance of this period C2 mazda lamps have been found very successful. The color of this light, nearly white, blends with the daylight and work can be carried on with very little interference.

In the foregoing only the monetary aspect of artificial lighting has been considered. The physiological aspect has been studied, showing the effect of intensity of illumination on the working of the eye. This investigation was conducted over a range of intensities from 4 to 36 ft. c. It was found that with increasing intensity a gain was obtained in visual acuity, power to sustain acuity, speed of discrimination and speed of adjustment of the eye for clear vision at different distances, figs. 4, 5, 6 and 7. These gains were greater for eyes with slight uncorrected defects than for normal eyes and there are indications that the middle-aged and aged eyes are benefited more than young eyes. The increase in acuity is very rapid up to about 5 or 6 ft. c., after which it becomes more gradual. The other functions of the eye that are affected by time show a more

gradual gain at lower values and more rapid at higher intensities. The power to sustain acuity of vision shows the greatest increase.

These functions of the eye all have a very direct bearing on the amount and quality of work that can be performed by an individual and the ease with which it can be done and a knowledge of their performance under varying intensities of illumination proves that increased production with increased intensity is based upon sound physiological facts and is the logical result. It also points the way for the conservation of the eyesight of the people and the elimination of the evils that have resulted in the past from prolonged use of poor lighting.

In view of the conditions under which high intensity lighting has been evolved, it is not surprising that the greatest improvement has been made in the industrial field. The value of high intensity has been firmly established from both the economic and hygienic viewpoints and there are strong indications that we are in the threshold of a new era of artificial lighting that will include all branches of industry and commerce.

#### RIVET CUTTING RECORD

What is believed to be a record for cutting rivets in the dismembering of steel freight cars was recently established by an operator who cut out 1,308 rivets in 2 hours and 46 minutes. Of this number 683 were  $\frac{5}{8}$ -inch rivets, 228 were  $\frac{3}{4}$ -inch rivets, and 127 were  $\frac{7}{8}$ -inch rivets.

The cutting was done on a standard Erie car under general yard conditions, the operator taking the rivets as they came, working inside, outside and under the car. The car was one that had been retired from active service and that was in the car shop for repair, the rivets and plates being covered with heavy scale and rust, thereby rendering the cutting extremely difficult.

It is said that the record applies not only to the number of rivets cut in the time required, but also to the low consumption of gases used, the job taking only 384 cubic feet of oxygen and 83 cubic feet of acetylene. The operator used an Oxweld cutting blowpipe with a rivet cutting nozzle.

#### AUTOMOBILE INDUSTRY HAS A BETTER OUTLOOK

There is a much better feeling existent regarding the automobile industry. Representatives of Wall Street brokerage houses state that production is still about 50 per cent. of capacity, but many companies are receiving new orders. This is particularly true of the manufacturers of parts, indicating that motor car manufacturers have used up their supply and the fact that they are buying parts was taken to mean that motor car buying is on the increase.





# WELDING AND CUTTING



## Hints on Oxy-Acetylene Welding and Cutting

Care of Welding Rods—The Use of Fluxes—Manipulation of Blowpipe—Proper Adding of Welding Rod

**S**TEEL and iron welding rods should always be kept in a dry place to prevent rusting. If they do become rusted they must be thoroughly cleaned before using.

### Fluxes

Some metals do not flow together readily under the action of the blowpipe flame. By using a suitable flux this difficulty is overcome. A welding flux is a combination of chemicals in the form of a powder which assists fusion and either prevents the formation of oxides, or breaks down oxides when formed; or, as in the case of grey cast iron, keeps the carbon in the "graphitic" or free state.

Flux should not be sprinkled on the weld, but should be applied by dipping the heated welding rod from time to time into the flux, enough of which will adhere to the rod. Flux at all times should be used sparingly.

Fluxes always should be kept in airtight tins, as some absorb moisture and others deteriorate if exposed to the air for any length of time.

For successful welding, it is absolutely necessary that the proper flux be used. Fluxes should be purchased from a reliable company, preferably from one making a specialty of this particular line and recognizing fully the conditions to be met. Cheapness should never be a guide in the purchase of this material.

### Manipulation of Blowpipe

The blowpipe must be grasped firmly but not rigidly in the hand. It is not good practice to hold it in the fingers, because it is impossible to manipulate the flame with as great regularity and control, nor will it be possible to do as heavy work without tiring.

Occasionally the hose is thrown over the man's shoulder. In this case the weight of the blowpipe is suspended and held by the tubing, so that it is only necessary to impart the typical welding motion to the blowpipe, which can usually

be done by the fingers. The movement of the welding flame is hindered, however; and this method is therefore not recommended, and should be used only as a relief when the work is of long duration and the operator's wrist and forearm become tired.

The head of the blowpipe should be inclined at an angle of about 60 degrees to the plane of the weld, "as in Fig. 15.

*This information will be continued in later issues, and we will take up the subjects of irons and steels, pipe welding, cast iron, etc. We are indebted to the Oxweld Acetylene Co. for the use of this material.—EDITOR.*

The inclination of the head should not be too great, because the molten metal will be blown ahead of the welding zone and will adhere to the comparatively cold sides of the weld. On the other hand, the welding head should not be inclined too near the vertical because the preheating effect of the secondary flame will not be efficiently applied.

There are certain cases, however, where the conductivity of the metal is such that it is not necessary to utilize this preheating. Also certain metals have the property of absorbing the gases of this flame. Consequently, in these cases it is best that the flame impingement be concentrated to as small an area as possible.

The motion of the blowpipe should be away from the welder and not toward him, as closer observation of the work

can be obtained and greater facility in making the weld will be experienced.

Where thin sheet material is being welded and it is not necessary to use a welding rod or wire, a weld may be produced by moving the blowpipe in a straight line. It can readily be seen that this does not apply to welds which have been bevelled, and which require the use of filling material, for in this case a swinging motion must be imparted to the blowpipe to take in both edges of the weld and the welding wire at practically the same time.

In comparatively light work a motion is imparted to the blowpipe which will cause the incandescent cone to describe a series of overlapping circles, the overlapping extending in the direction of the welding. In order that the weld be of a good appearance this must be constant and regular in its advance. The width of this motion is dependent upon the size of the material being welded and varies accordingly with the nature of the work.

In heavier work, if the above system were used, a great deal of the motion would be superfluous. Consequently either an oscillating movement or one in which the jet of the blowpipe will describe semi-circles should be used (Fig. 16). This confines the welding zone and while the progress is not so fast, it is more thorough than the other system for this class of work.

To the average beginner the regular control of these motions is difficult, and considerable practice is required to become skilled. It is the regularity of these motions that produces the characteristic even-rippled surface of good autogenous welding. The progress of a welder and the quality of his work can be determined to some extent by the skill with which he produces this effect.

After the swinging motions of the blowpipe have been mastered, the next step will be to introduce the welding rod into the weld in such a manner that the regular advance of the blowpipe will not be hindered nor retarded. It can be seen that there is quite a little attention needed to secure perfect co-operation between the two hands, one controlling the blow-

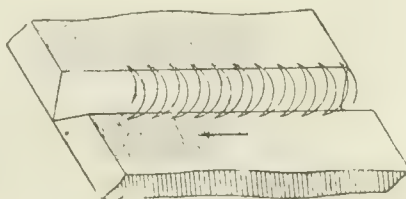


FIG. 16—MOTION OF FLAME FOR WELDING



pipe and the other adding the welding rod.

The welding rod should be held and inclined as shown in Fig. 17. In this position sufficient quantity of metal may be added at the right time. With the welding rod held in a vertical position or horizontal, the possibility of the addition of an excess of metal, part of which is not fused, is great. In adding this metal, care must be exercised that the edges of the weld are in the proper state of fusion to receive it. If the metal is not sufficiently hot, the added material will merely stick to the sides and fusion will not exist. It is therefore necessary that, by the motion of the blowpipe, fusion be produced at the edges of the weld equal with that of the welding rod.

The usual faults of the beginner are failure to introduce the welding rod at the proper time into the welding zone, to hold the rod at the wrong angle, or to fuse either too little or too much of the rod. The filling material when melted should never be allowed to fall into the weld in drops or globules. When the proper time arrives to add it, the welding rod is lowered into the weld until it is in contact with the molten metal of the edges. When in this position the flame of the blowpipe is directed around it, and thus fusion is produced. It is customary to add metal in excess to that of the original section. There are several very important reasons for doing this. First, the weld is reinforced and the strength is accordingly increased. Second, in case a finished surface is desired a sufficient stock must remain to allow for finish. Third, small pinholes or blowholes may be found just under the surface of the weld, which do not extend to any depth, and may be removed by filing or machining.

The welding of different kinds of metals very often requires different methods, all of which cannot possibly be covered under any general rule. For this reason we will consider these subjects in a later issue.

H. Massicotte and Freres, Inc., Cap de la Madeleine, Que., intend erecting a plumbing shop and public hall costing \$10,000.



THIS VIEW SHOWS THE WORK PERFORMED.

#### ANTI-CARBURIZING PAINT

As is well known, it is necessary on occasions to localize the effects of case-hardening. Messrs. Alfred Herbert, Ltd., Coventry, England, have placed an anti-carburizing paint on the market for such purposes. Any spot which is required to remain soft is merely covered with this paint, which prevents the carbonizing of that particular place. No special preparation of the part is necessary except that the surface should be quite free from dirt or grease. The compound is applied to the article with an ordinary brush on such parts as are to remain unaffected by the casehardening. It is then allowed to dry, and the article packed in the casehardening box in the usual way. When the hardening process is concluded the paint will be found to have fused to a glass-like substance, which can be removed by scraping or sandblast. Their Canadian office is at 1-3 Jarvis Street, Toronto.

Tests with glass insulators have been in progress in Switzerland for several years, and numbers of these insulators have been used in France and the United States for potentials up to 50,000 volts. The principal application for glass insulators is, however, up to 25,000 volts. Such failures as have occurred with glass insulators, says Practical Engineer, have been due principally to internal stresses which cause cracking when the insulator is subjected to heavy mechanical stress or sudden temperature change. The occurrence of such failures has been made less frequent by the use of im-

proved material and better annealing. As for the puncture strength, it is higher than that of glazed hard porcelain. The glass used in Switzerland is clear and transparent, hence the absorption of solar heat is less than in the dark green glass hitherto employed.

#### THE OLD TERM HORSEPOWER

What is a horsepower? Briefly, it is a rate of doing work. If you lift 550 pounds, one foot, in one second, you have actually completed a horsepower of work. Naturally, a horsepower is able to raise twice that weight one foot in twice the time, or one-half foot in just that time. Moreover, it can raise half 550 pounds one foot in half a second, or two feet in a second, and so on. Therefore, when we lift one-fourth of that weight, 137½ pounds, four feet in one second, we are exerting a horsepower.

This being granted here is what we get. If a person who weighs 137½ pounds runs upstairs at the rate of four feet a second, he is exerting the equivalent of a horsepower. For a man weighing twice that much, 275 pounds, it would be necessary to climb at the rate of only two feet a second to exert a horsepower. It is possible to do much more.

As a matter of fact, a horse often exerts many times a horsepower. The average horse can draw a wagon up a hill where a ten horsepower engine would fail. A horsepower does not represent the greatest momentary strength of the average horse, but is a measure of the power which he can exert continuously.

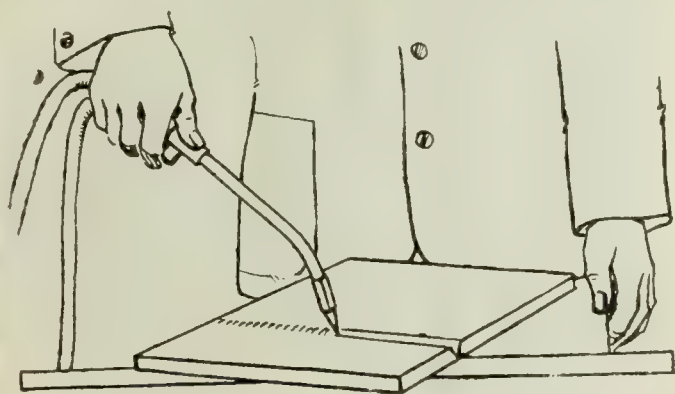


FIG. 15—CORRECT METHOD OF HOLDING THE WELDING BLOWPIPE.

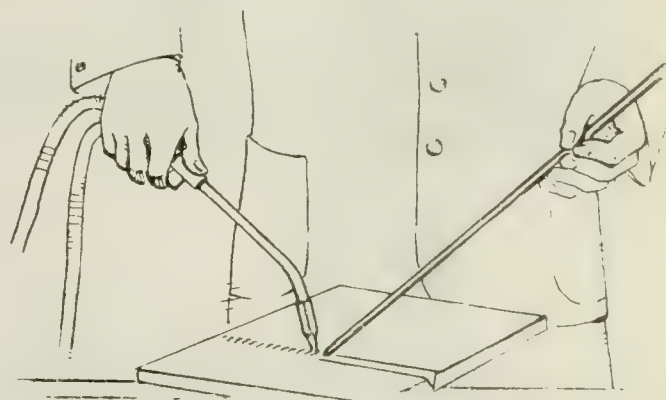
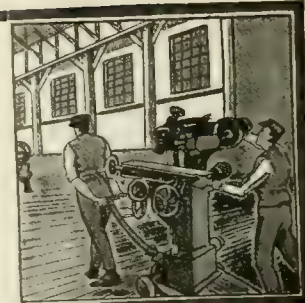


FIG. 17—CORRECT METHOD OF ADDING THE WELDING ROD.





## DEVELOPMENTS IN SHOP EQUIPMENT



### RADIAL DRILL DRIVE

The Fosdick Machine Tool Co., Cincinnati, Ohio, have introduced a new drive for their radial drilling machines. The illustration depicts their 4-foot heavy-duty radial drilling machine equipped with a five horsepower R. & M. 3 to 1 variable speed motor. It will be noted that the motor is mounted on the radial arm. A Cutler Hammer controller is also located directly on the spindle head.

One advantage of this arrangement is the swing of power through the elimination of two sets of bevel gears. The motor is also away from the dirt that usually accumulates on the floor. The arm is partially balanced and additional floor space around the base is available.

The outstanding feature of this particular application is the standardization. By such a method any standard make or speed of 3 to 1 variable speed motor may be used, thus avoiding the usual delay caused by the necessity of special patterns and castings for each particular type. A bakelite pinion is placed on the motor shaft, this varying in size according to the speed of the motor selected. All other gears are kept standard.

The fact that one motor only is used is regarded as a strong feature. The elevating mechanism drives from this motor through the regular standard gear arrangement. The controller, as seen

mounted on the spindle head, is made more convenient of operation by the bevel gear connection to the handwheel below it. This type of control is preferred in shops where the work is usually on large castings where the spindle head is frequently at the upper and outer extreme.

A more popular location for the controller is on the arm girdle, convenient to the operator's left hand. This eliminates the large flexible conduit in the rear of the arm, and is the most satisfactory for the average run of work. This type of drive is furnished on the 4, 5 and 6-foot heavy-duty radials.

### ROCKFORD AUTOMATIC LATHE

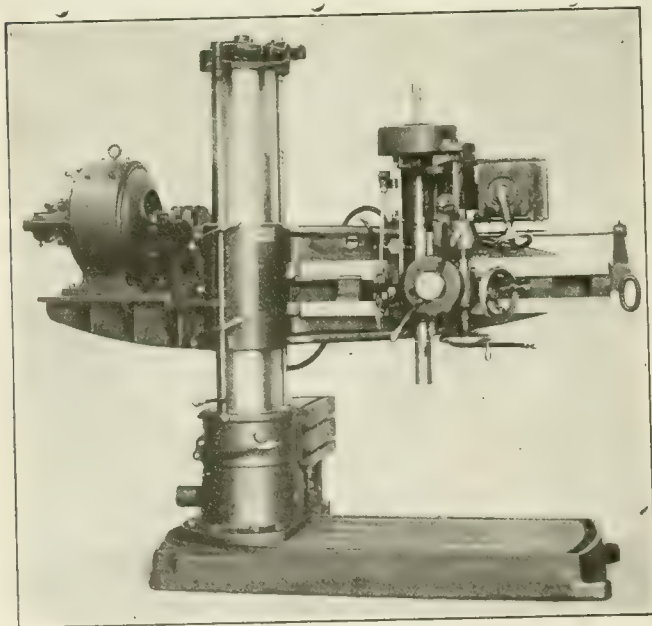
The accompanying illustration shows an automatic lathe that has recently been added to the line of the Rockford Machine Tool Co., Rockford, Ill. The machine is intended for the rapid production of duplicate parts, especially for the turning of pistons, pulleys, cone pulleys and gear blanks where multiple tools can be used and the turning and facing operations done at the same time. It is built on the lines of a 22-inch heavy-duty lathe so as to insure absorption of vibration and to withstand the severest service.

The machine is provided with three changes of speed, operated by means of a gear-shift lever. The driving gears are

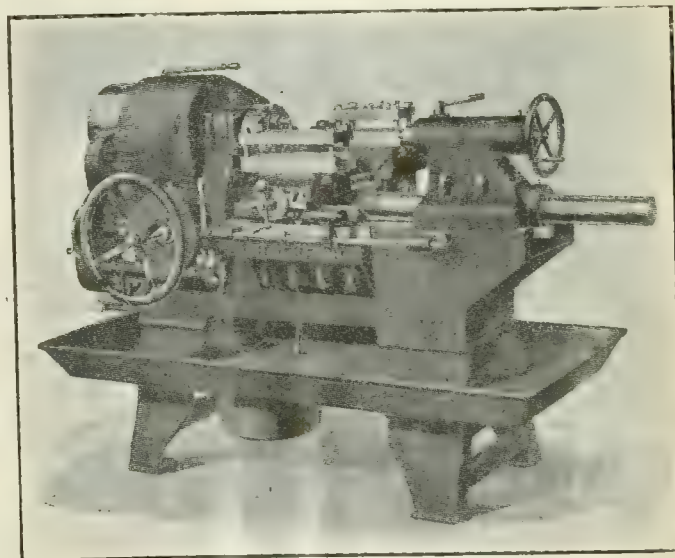
of wide face and large pitch, the main drive being through helical gears, to give smooth running. The machine is driven by a single pulley of large diameter and wide face, the operating lever for controlling the starting and stopping of the machine by means of the clutch within the pulley being in easy reach of the operator. The machine has geared feed driven direct from the spindle through a train of spur gears, the lower two being slip gears so that variation of the rate of feed may be obtained.

The head stock is cast in one piece with the bed so that there is no chance for give of the head. The front, or turning carriage, is mounted on a 3½-inch bar, which has long bearings in both the headstock and the tailstock, the outer end of the carriage being supported on a hardened steel way that can be shaped so as to give to the work taper, convex or concave form. Rack teeth are cut in the bar and mesh with the cross spindle of the machine for obtaining the feed. A worm and worm gear driven direct from the feed gears furnish power to the cross spindle, the worm being mounted in a drop frame so that the feed may be released at any predetermined position.

The back or facing head is mounted on a bracket on the back of the machine in alignment with the spindle and is held in place by a tongue and groove and four bolts. This facing head is adjustable longitudinally according to the position of the work. Both turning and facing



VIEW ILLUSTRATING THE DRIVE TO DRILL.



GENERAL VIEW OF THE LATHE.



carriages are provided with suitable tool blocks so that any desired number of tools may be used at the same time. The power feed for the rear or facing head is obtained through a cam drum, driven from the cross spindle by rack and pinion, enabling both the turning and the facing heads to be controlled by the same stop, the time taken to finish any operation being the time of the longest cut. Any shaped cam may be mounted on the drum, making it possible to secure different feeds on the rear head than provided by the feed gears for the turning head. The tail stock is of the four-bolt type, and has a quick-acting spindle for releasing the center. It is provided with a rack and pinion for changing its position. The bed has an oil pan with reservoir for supplying cooling lubricant to the work, the pump being driven from the pulley shaft of the machine. The machine can be furnished arranged for direct motor drive. The motor is then mounted on a bracket and connected to the pulley shaft of the machine through spur gears, a large clutch gear being used in place of the clutch pulley used for belt drive. Following are the principal specifications:

Swing over side carriage bar 14 inches, swing over cross carriage  $10\frac{1}{4}$  inches, maximum distance between centers 18 inches, travel of side carriage 12 inches, front spindle bearing  $4\frac{5}{8} \times 6\frac{1}{8}$  inches long, rear spindle bearing  $3\frac{1}{2} \times 4\frac{7}{8}$  inches long, hole through spindle  $1\frac{1}{4}$  inches, taper hole in spindle No. 5, diameter spindle nose  $3\frac{1}{8}$  inches, length spindle nose  $2\frac{5}{8}$  inches, threads per inch 5 U.S., tailstock spindle diameter  $2\frac{7}{8}$  inches, diameter drive pulley 14 inches, width of drive belt 6 inches, weight 3,500 pounds.

#### ROTARY EMBOSSING MACHINE

A rotary embossing machine has been placed on the market by Julius Merey, Chicago, Ill. The machine is intended to emboss legends especially on tubular objects, such as cans and similar containers. It does embossing on flat objects.

The main frame of this machine is made from cast iron, wherein four large cast iron boxes with phosphor bronze bushings are housed. The two lower ones are stationary, while the upper ones are fitted for up and down movements. Two large embossing shafts are fitted into above bearings.

The machine has a lock device to keep embossing shafts closed while embossing is in progress, and has also an automatic stop. The embossing dies, male and female, are made of segments, which are interchangeable, and provide for setting out any names, etc.

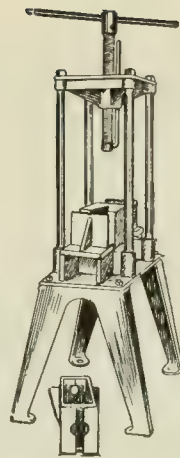
The smaller frame is intended to hold objects by means of chuck, and has a longitudinal and vertical movement subject to various dimensions of objects, and connected from main frame by means of spur gears. At the end of

the connecting main shaft is an adjustable friction plate, this permitting objects for various diameter dimensions to follow the arcs of the embossing die segments. The machine weighs, about 2,000 lbs., and has a capacity for three rows of embossing at the same time on 16 gauge steel or lighter. Power required, 3 h.p.

#### BENCH TAPPING MACHINE

The Taylor-Shantz Co., Rochester, N.Y., have placed on the market a bench tapping machine as shown in the illustration. The machine is used in tapping threads of all sizes up to and including 5-16-inch diameter. The tap is driven in the required direction for tapping as soon as the work is pressed against it. It is also automatically reversed when the work is pulled away.

A leather faced disc is used between the pulleys, this minimizing the danger of tap breakage. The machine can be driven from the lineshaft with one straight and one cross belt. The bed of machine is  $7\frac{1}{2}$  inches, and the pulleys are 5 inches diameter by  $1\frac{1}{2}$  inches face. The weight of the machine complete is 21 pounds.

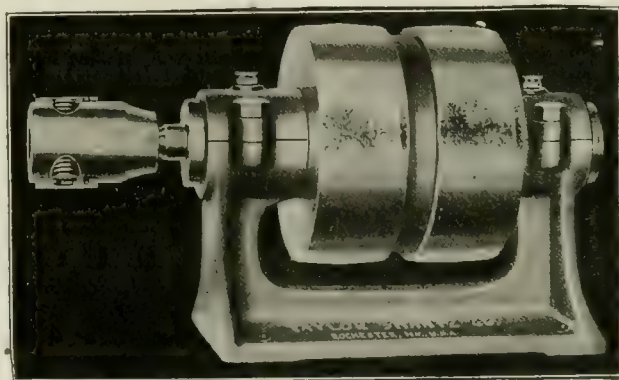


GENERAL VIEW OF THE ARBOR PRESS.

ments, such as sliding L-blocks, etc., are used in conjunction with the press where necessary.

#### ROTARY WIRE BRUSH

The Independent Pneumatic Tool Company, Chicago, Ill., have placed on the market a special rotary wire brush for



GENERAL VIEW OF THE TAPPING MACHINE.

#### ARBOR PRESS

The R. S. Whitney Co., Lewiston, Me., have placed on the market an arbor press as illustrated. These presses are said to be light in weight, and compact in construction. Both the head and base of press are webbed to supply strength and withstand strains.

The base is provided with ways like a lathe, this permitting the blocks to slide into various positions. A large recess through the base is provided to allow the passage of shafts, gears, etc.

The screw of press has a square thread, the head being supplied with recesses allowing the use of two bars when exceptionally heavy pressure is necessary. The press has a patented feature that consists of a single rod sliding parallel with the screw and attached to a cap on the pressure end of the screw. This prevents twisting strains on the surface of the works. The press is made in two sizes, namely, 30-ton and 50-ton, and various attach-

use on their No. 71 portable pneumatic grinder and No. 6 electric grinder. In reality the brush attachment makes two tools in one. The grinder can be used with emery wheel, and with very few changes the brush attachment can be added. The brush, which is attached to the No. 6 electric grinder, is smaller, because of a higher number of revolutions per minute and requires a few attachments not necessary on the grinder.

The wires in the brush are of equal length, interchangeable, and are made of specially treated steel. The concave wood back, which, in turn, is fitted inside a metal cover, secures the brushes in position, which also permits of tapered ends or working surface allowing the wires to bend under pressure without breaking.

These brushes are said to be particularly useful for removing paint, rust, scale, grit, dirt, sand; also for cleaning steel cars, automobile bodies, steel frames, tank cars, foundry castings, and sheet metal of all kinds.



# Have You Tried This Contest Yet? If not--- Do so Now

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.

To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.



The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

## What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

The winner for February 17th issue is Charles E. Mars, Brantford. There is quite a story connected with this contestant. He forwarded a list of answers, thought better of it and sent us another list, requesting that we destroy the first one. His persistence counted, for his second list was correct. It's the old story of "If at first you don't succeed, try again." Readers who have tried and failed to land on top will no doubt get added pep from this little story.

### CONTEST FOR MARCH 10TH ISSUE

Contestants are required to write us, stating to which advertisements we refer in this number.

- 1—Something in a machine that ensures proper lubrication.
- 2—How to secure expert advice on a certain kind of problem.
- 3—How to save money.
- 4—A reasonable request.
- 5—Something claimed to have accuracy and a wide range of service.
- 6—How to keep your shop clean.
- 7—How to get high cutting and high return speeds on a certain type of machine.
- 8—Something that is said to be free from vibration.
- 9—How to boost your production.
- 10—Something that costs less for upkeep.
- 11—A product that has four heads, yet no eyes in any of them.
- 12—That you can reverse a part of a certain product and use it with equal success.

### These are Correct Answers for List from February 17th Issue:

- 1—Morse Chain Co.
- 2—Oliver Machinery Co.
- 3—L. S. Starrett Co.
- 4—The Hull Iron & Steel Foundries.
- 5—United States Electrical Tool Co.
- 6—Garlock-Walker Machine Co.
- 7—E. C. Atkins & Co.
- 8—Dunbar Brothers.
- 9—Algoma Steel Corporation.
- 10—The Walton Co.
- 11—Tallman Brass & Metal, Ltd.
- 12—Katie Foundry.

**Closing Date for This Contest is March 24th.**



# Proper Safeguarding of Machine Tools in General

Use of Cast Iron as Suitable Material for Safeguarding—Forms and Types of Guards—The Danger of Projections—Flywheels—Revolving Cutting Tools and Sliding Parts.

By G. STEVENSON TAYLOR, O.B.E.

**T**HE subject of properly safeguarding machine tools is at all times an interesting study, and in a recent paper by Mr. G. Stevenson Taylor some interesting and valuable points were brought out. This paper was presented at the Industrial Safety Conference in England and the following points abstracted from the talk should prove of decided interest to our readers:

In safeguarding the ordinary parts of machines the following are regarded as the essentials of a satisfactory safeguard: (1) It should prevent access to the dangerous part so long as the danger exists; (2) it should be constructed of such materials and in such a manner as to withstand the wear and tear to which it is likely to be subjected; (3) wherever practicable it should form an integral part of the machine and have been considered in its design; (4) it should, where necessary for intermittent dangers, be automatic in action; (5) its removal should not be necessary for the purpose of lubricating parts of the machine or the material under operation, or for changing belts, gears, etc.; (6) it should not introduce any fresh risk of accident; (7) it should be so hinged or hung as to be easily opened or removed when frequent adjustments and alterations are necessary, but in such cases should not be easily removable from the immediate neighborhood of the machine; (8) it should not interfere unduly with the output of the machine.

The selection of a suitable material for the construction of safeguards is a matter of utmost importance, but, unfortunately, often receives very scant attention from machine users, and sometimes from machine makers. Wood, cast iron, sheet metal; rods, tubes, and bars of metal; wire work and all expanding metal, millboard, and papier-mache, may all be utilized, and may all prove satisfactory under particular circumstances. When substantially and firmly constructed of sound timber, wooden guards for such parts of machinery as pulleys, belts, small fly-wheels, and shafting, can be both neat and effective. The use of wood for guards has, however, many disadvantages; it is easily splintered and broken, readily absorbs liquids, and increases the fire risk.

## Use of Cast Iron

Cast iron is a particularly suitable material for the safeguarding of many dangerous parts of machinery. Guards

of this material can be designed so as to form an integral part of the machine and to meet all other conditions which have been laid down. One objection often raised against cast-iron guards is that the gears or parts covered cannot be readily seen or oiled. Generally the guards can be removed at intervals to make an examination, and if there is any special danger of keys or screws working loose inside the guards, small sight holes with loose covers can always be arranged in them. Lubrication with the guard in place can nearly always be arranged, and in many cases the cast-iron guard will serve as an oil bath.

## POINTS BROUGHT OUT

First—The guard should protect the dangerous part as long as the danger exists.

It should be constructed of proper material to withstand wear and tear.

It should form an integral part of machine if at all possible, and should be embodied in the design.

Should the danger be intermittent, the guard should be automatic in action.

Guards should be so constructed that oiling can be accomplished without their removal.

Above all, the guard should help rather than hinder the output of the machine.

Sheet metal, especially sheet steel of suitable gauge, is an excellent material for guards. Simple forms of guards can be easily and cheaply produced by stamping when required in sufficient numbers, and can be made to conform to all the conditions which have been laid down for a satisfactory guard.

Rods, tubes, and bars of metal are suitable for some classes of safeguards, especially those which are effective at a distance of 18 in. from the part of machinery guarded. Unless this is the case these materials should not be used except with small spacing, or in conjunction with sheet metal, wire work, or expanded metal.

Wirework and expanded metal are similar materials for guard construction, except that expanded metal often has a somewhat sharp edge which may cause cuts and may also render it unsuitable for guards where delicate or fibrous materials are dealt with. Such guards, however, are likely to be deformed by rough usage, they do not exclude grit or dust

from the parts covered, and they are difficult to clean, especially where fibrous dusts are produced or adhesive materials handled.

Millboard, papier-mache, and similar materials have only been used in the construction of some patented types of safeguards for revolving shafting. Where, as on overhead shafting, they are not subjected to rough usage, such safeguards have proved effective and durable.

The following are the principal accident-producing parts of machinery, or machines in engineering works: (1) Plain shafting, spindles, etc., bars and rods in automatic lathes; (2) projections, such as set-screws, studs, bolts, key-heads on collars, couplings, clutches, pulleys, etc.; lathe carriers, drivers and jaws of chucks; (3) fly-wheels, armed pulleys and wheels; (4) driving belts, ropes and chains; (5) spur and friction gearing; (6) revolving cutting tools; (7) grindstones and abrasive wheels (bursts); (8) sliding and reciprocating parts, including plungers of presses, punches, etc.; (9) hoists and lifting appliances, cranes, etc. This list is not exhaustive, but it shows the principal sources of machinery accidents where safeguards can be adopted with advantage.

## Forms and Types of Safeguards

All shafting within 6½ ft. of the floor, or within this distance of any place where persons have access whilst the shafting is in motion, should be efficiently safeguarded. It is not possible to guard the whole of the exposed parts of drill spindles, but additional protection could be fitted with advantage in many cases. Accidents due to clothing being caught by twist and other drills can only be prevented when a satisfactory drill holder is devised which will allow the drill to run free except when pressed on the work. The safeguarding of the shafts and universal couplings of milling machines is more difficult than that of ordinary shafting, as the shaft varies in both length and direction. Two telescopic lengths of tube with gimbal fittings at each end will generally meet the difficulty. Some machine-tool makers have fitted cast-iron covers over the universal joints, but have left the shafts exposed; others have fitted an open coil of wire over both joint and shaft, but this is only a partial guard and does not prevent a loose end of clothing from getting on to the joint or shaft. As in the case of lineshafting, the best form of guard consists of a tube or tubes completely enclosing the bar. The tubes can



be carried on standards and adjusted to the length of the bar.

### Projections

The risk of serious accident from revolving plain shafting, spindles, etc., is considerably enhanced if they carry collars, couplings, clutches, pulleys with any projecting parts, such as set-screws, key-heads, etc. All set-screws in collars and other revolving parts of machinery and machine tools should be recessed below the surface of the revolving part; and there is no reason why this simple precaution should not be taken on all new machinery. Where this is not practicable on existing machinery the projecting screws should be properly covered with suitable sheet or cast-metal casings.

### Flywheels

For safeguarding fly-wheels, etc., standard and rail fencing may be satisfactory if double or treble rails are used and placed not less than 18 in. from the moving parts, the top rail being not less than 4 ft. from the floor, and if there is a covering of sheet metal or wire work, either from the floor to the bottom rail or extending at least 6 in. above the floor to prevent tools, etc., falling under the rail.

If it is necessary to carry the fencing closer to the fly-wheel or pulley—and, on the whole, close fencing is the more satisfactory—then the guard should extend to a height of 6 ft. 6 in., or to the top of the pulley or fly-wheel if less than this. The guard should consist of sheet-metal, wirework or other close material on a suitable frame. Fly-wheels and pulleys should be fenced on both sides as described if they have to be approached for any reason. The fly-wheel of a gas or oil engine is often well guarded on the outside, but on the crank side, where it is constantly approached by the attendant when feeling the bearings, it is frequently left quite unguarded.

The parts of overhead pulleys which are within reach of workers—i.e., less than 6 ft. 6 in. from the standing place—should be safeguarded underneath by strong sheet-metal or other guards.

### Driving Belts—Ropes and Chains

Accidents from belts mainly arise (1) by trapping at the intake of belt and pulley, (2) by persons being caught by loose belts hanging on shafting, (3) by belt or belt fasteners striking a person, (4) from fracture of belt. Accidents from rope and chain drives arise chiefly from causes (1) and (4). Where a pulley is suitably guarded the intake of the belt will also be guarded. Many accidents at belt intakes are caused by persons removing, replacing, or shifting belts by hand. The danger in connection with the first two operations can be largely eliminated by the use of fast and loose pulleys and proper striking gear, also by the use of proper belt poles or mechanical belt shippers. A belt should never be allowed to rest on a revolving shaft, owing

to its liability to seize on the shaft and wind up, involving either accident to the person who may be touching the belt, or injury to the machine with which it is associated. Belt perches, hooks, or hangers should be provided for loose belts, unless they can rest upon the guard provided for the shafting.

Driving chains are now largely used in connection with motor and other drives for machine tools. They should always be completely enclosed by either cast-iron or sheet-metal guards. The majority of machine-tool makers have embodied some excellent guards for chain drives in the design of their machines. The guards not only form an oilbath, but also a dustproof casing for the chain and sprocket wheels.

### Revolving Cutting Tools

Milling machines are the principal machine tools with revolving cutters which give rise to accidents in engineering shops. The majority of accidents occur on the narrow circular-saw type of cutter, but also to some extent on other types. They are generally due to the worker's fingers or hand or arm coming into contact with the cutter whilst reaching over the revolving cutter or whilst gauging his work. Guards for milling cutters should (1) prevent contact with the cutter, (2) be readily adjustable, (3) not interfere with a view of the work, (4) not prevent proper lubrication of the work. Several guards have been patented which comply with these requirements, and some in addition facilitate proper lubrication of the work.

### Sliding and Reciprocating Parts

Accidents are caused either by crushes between the moving parts and some fixed

structure, or, in the case of quick-moving parts like the tailrod of an engine, by a direct blow. Such parts as the latter can be readily safeguarded by being enclosed in a metal tube or covered with an inverted trough of sheet metal. Planing and similar machines with sliding parts should be fixed in the shop so that the part cannot run within 18 in. of any wall or other fixed structure, nor should it traverse any alleyway or the space in front of any doorway. The beds of planing machines should be filled in with perforated sheet metal or similar material, as accidents have occurred through men either slipping into the bed or attempting to obtain tools stored therein (a dangerous practice) whilst the machine was in motion.

Accidents due to crushing of hand or fingers by the plunger on power presses of various kinds form an appreciable percentage of the total machinery accidents. The essential feature of a satisfactory guard for the plunger of a power press is that it should prevent the hand or fingers of the operator being under the plunger when the latter descends, whether its motion is due to the proper use of the controlling mechanism or to "repeating." It may be noted that the use of a double-handed control on presses does not obviate accidents due to "repeat" strokes. For straight blanking on small work and other simple operations, fixed guards are quite effective. They may be made of sheet metal, rods, or wire work, and should surround the plunger, merely leaving a narrow slot through which the sheet can be inserted. Guards of varying sizes must be used with the different sizes of guides.

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# CANADIAN MACHINERY

## AND MANUFACTURING NEWS

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## The Use of Milling Machines

THE development of the miller as a manufacturing tool has been nothing short of marvellous within the past few years. There was a time when a milling machine was looked upon as a tool-room proposition—and a very risky one at that. This condition, however, is past and gone, and at the present time there is hardly a plant of any proportions that cannot boast of its miller equipment.

In fact in the larger manufacturing plants they have their milling machine department. Row upon row stand these accurate producers. Small, medium, and large, they each accomplish the work best suited to them. The manufacturing miller of to-day is a more rugged machine tool than formerly. It is built to stand the gaff, to use a common expression.

Operations are now performed on this type of machine that were deemed impossible before. Take for example the problem of cutting the worm shown at Fig. 10 in the first article of the present issue. Here is a job that would have puzzled the old boys of the early school, but nowadays a little problem like this is of no account. By building a special attachment to operate in conjunction with the regular machine the difficulty is overcome.

This brings out very forcibly the need of proper fixtures to be used as an aid to the machine itself. To obtain production we must have jigs that are as fool proof as possible. No machine can do its best work unless aided by fixtures of some nature or other.

Time occupied in the studying of the problems shown in this first article will be time well spent, for it may throw light on the very problem you have been concentrating on for some time past.

## Protecting the Fireman

IN a recent issue of a journal which specializes in technical subjects arranged for the understanding of the layman, there appeared recently an article of interest to the engineering profession.

From this it appeared that the man who is engaged in the task of generating steam in the boiler by shovelling coal is frequently inconvenienced by the heat. This is something we have noticed ourselves, but it is nice to have it confirmed by such an authority. We must confess, however, that the way to avoid this inconvenience had not previously suggested itself to us. This is all the more remarkable as it appears so simple. All that is required is to make the furnace doors and fronts hollow, and through the passage thus formed circulate cool and refreshing water. The author goes further, and says this system can be applied to other parts of the boiler. Why of course it can! When we come to think of it

there are lots of places it could be applied. For instance, imagine what a delightful place the boiler room would become were the shells of the boilers jacketed before the lagging was put on. The steam pipes could be run through a larger pipe, with circulating water in the space between. There would be all kinds of comfort in the boiler and engine room then.

However, we always had the idea that all the heat possible should be retained in the boiler and steam pipes. The method of keeping boiler furnace doors cool always seemed to us to be by keeping the fire clear of the dead plate, as we always found that burning coal on the dead plate didn't help the generation of steam greatly. On the other hand, it was good for the manufacturer of arch bricks, furnace door baffle plates, etc.

Again we must confess, however, that the simple idea of a water jacket never entered our head.

## It Crops Up Again

SOMETIMES we think the type of inventor who believes he can get more out of a machine than he puts in has died out. Then suddenly our hopes are shattered, and from out of the void comes a voice crying "Eureka! I have found it." Needless to say the owner of the voice only thinks he has found it. It isn't there to find.

A gentleman by the name of H. Nicolaides is the latest to spring the old story. He has a machine, or principle by which he claims he can do roughly 173,000 foot-pounds of work in an air cylinder by the expenditure of 60,000 foot-pounds in the steam cylinder. The method he proposes is somewhat involved, and requires careful reading before his idea is grasped. However, we still believe that Baylis Law holds good, our inventor to the contrary notwithstanding. He traces back the prophecy of his contrary through the shades of Greek mythology, leading up to a vision which was vouchsafed to him, which started him to thinking deeply.

This inventor is generous. He wants no reward but renounces his claims freely to the government and the people. He wishes the government to proceed gradually with the manufacture, as he does not wish existing industry to be shattered at one fell swoop. He is quite ready to appear before a body of scientists and engineers, and if he does not convince them, will voluntarily retire to an asylum. That would seem to us to be a wise step.

The machine has never yet been built by man which is 100 per cent. efficient, let alone over 100 per cent. We doubt very much that it ever will. The fundamental principle that you cannot get more out of a machine than you put in remains as immutable as ever. If ever that condition should be changed, then indeed would this world, in the words of Mr. Nicolaides: "Be transformed from a vale of tears to a veritable Paradise."





## MARKET DEVELOPMENTS



### Reduction in Price of Steel, Will it Come Soon?

Interest Centers on This Possibility—Machine Tool Enquiries Are Much Larger—Scrap Market Still Dull, But in All Phases of the Market Good Times are Looked For

**"G**OOD times are ahead." Machine tool dealers feel sure on this point and expect that the enquiries they have been receiving will lead to actual business. American concerns locating in Canada are taking advantage of the exchange rate and are purchasing everything possible in Canada, as by so doing they get better value for their money.

Many stories are rife regarding the U.S. Steel Corporation. One report states that a decline is looked for hourly, but whether this is so or not remains to be seen. Many large agricultural implement makers have taken on stocks at present prices and should a sudden drop take place these interests would be seriously involved.

Trading in the steel industry is extremely light at some points, the customer in many cases ordering only sufficient

material to carry him over. In fact in some quarters business is confined almost entirely to repair work. Hope is expressed that next month will see a decided improvement.

The scrap metal market remains dull. Some dealers are said to be losing money every day and in some quarters manufacturers are storing their scrap in the yards until prices are better. One dealer states that prices will advance when conditions reach normal.

Ontario holds the spotlight this week, there being more actual buying in this province than in any other. The labor situation in United States demands attention, also the steel and freight problem.

Independents are not operating at more than 20 to 25 per cent. of capacity, while the corporation have dropped to about 60 per cent. against 90 per cent. in last January. Pig iron is also less than 50 per cent. of its actual productive capacity.

### BUSINESS AT PRESENT CONFINED ALMOST ENTIRELY TO REPAIR WORK

Special to CANADIAN MACHINERY.

**M**ONTREAL, Que., March 7.—Spring weather has had a cheering effect upon many individuals, but business has not, as yet, responded to the encouraging rays of a warmer sun. Merchants and dealers still report more than a seasonable dullness; as a matter of fact, past years have generally experienced a noticeable revival of trade at this period of the year, but there is little evidence that improvement in any direction has yet taken place, although many statements seem to prove the contrary. A representative of a large Montreal house, recently returned from a business trip to the States, told Canadian Machinery that many industrial centres across the line were gradually returning to more normal conditions and that operations in many of the metal trades were showing gradual but steady increase. Local dealers are still awaiting the time when they can truthfully say that business has improved. Occasionally an order comes through that leads one to believe that the tide has turned, but it proves to be only a wave slightly larger than the

usual ripple. There is no particular business where activity is pronounced, as quietness in all directions is still more or less general.

#### Repair Business Only

The steel situation has little to offer of special interest. Trading is carried on in a quiet way with a steady but light business done in warehouse supplies. Few tonnage orders are placed now, the requirements being for one or more plates, shapes, bars or tubes, for special purposes. Little attempt is made, on the part of the consumer, to secure more than he actually needs for the work in hand, and in many cases the dealer has quit urging the purchase of other materials, generally leaving everything in the hands of the user. Little has transpired during the past week to change the general tone of the market here, and dealers show no inclination to pass on possible developments. "Business at present," said one dealer, "is confined almost entirely to repair work, where one or two plates, a few bars or tubes, are

sufficient to make the repair, and it is seldom that we see a big order. Of course, it is the time of year when demand is never very brisk and we live on in the hope that the coming months will be a little brighter."

#### Metals Lower and Movement Light

The movement of non-ferrous metals continues light as consumers are still buying conservatively. Rock bottom prices do not appear to affect the market, and the buyer is not awakened even when quotations decline sharply. One satisfactory feature of the day is that manufacturers are not carrying stocks of any kind, for the stated reason that they desire to be in a position to take advantage of the lowest price. This would be all right if one could be assured of what was the lowest price. The depleted state of stock supplies in the average plant to-day means that a return to normal market would likewise mean a return of a demand, which at first would be greater than normal, the consequence being a strengthening of prices. An alternative to this possible condition would be to cover, in part, future requirements from existing supplies, to avoid excessive demand for material should business suddenly revive. "Speaking of



a waning market." remarked a dealer here, "there is little to wane, as prices on non-ferrous ingots and semi-finished materials are as low as they can possibly go.

"We may see slightly lower quotations, but with the present cost of production as a basis, a lower market would mean considerable loss to the seller of the commodity. What the trade should do now is to buy carefully, even for the future, but buy, as it is only in this way that normal business can be revived." A further slight decline has developed in ingot metals, coppers declining  $\frac{1}{2}$  cent per lb., tin, on a 2-cent drop, is quoted at 37 cents, and lead is off  $\frac{1}{4}$  cent per lb. at 6 $\frac{1}{2}$  cents. Spelter, antimony and aluminum hold firm at previous quotations. Copper products have likewise declined, the reduction being \$2.00 per hundred pounds. Copper bars,  $\frac{1}{2}$  to 2 inch, are now quoted at 30 cents per lb. Tinned copper sheets, 14 oz., are quoted at 38 cents, and plain sheets at 32 cents per lb. Lead sheets now range from 9 to 9 $\frac{1}{2}$  cents per lb. Demand in all cases is light.

#### Non-Ferrous Scraps Decline

There is little doubt that many old material dealers are losing money at the present time, and stand to lose considerably more if the present dull condition continues. Some dealers are carrying stocks that cost them much more to lay in than they could buy the stuff for just now. They are in hopes, however, that the spring and summer activity may be sufficient to establish a better market in scrap and that prices on many lines will advance to higher levels, enough to prevent any heavy run on stocks now held. One feature of the old metal situation is the comparatively low overhead necessary, but even in the scrap business it is not always good policy to break up the organization, as experience in the handling of old materials is often as essential as in other lines of activity. Apart from a further decline on prices quoted the market holds little of interest to the dealers, as consumers are not buying except to cover urgent needs, and these are exceptionally light.

Non-ferrous metals show a dullness that is reflected in lower price quotations. Coppers are down from one to one and a half cents, light copper being quoted at 9 $\frac{1}{2}$  cents per lb. No. 1 machine composition has declined 3 cents, the price quoted now being 10 cents per lb. Brass scraps are also weaker. Zinc is now 4 cents and tea lead 2 cents per lb. Aluminum has dropped from 15 to 12 cents per lb. Iron and steel scraps are holding firm on light movement, the only change being on cast borings, dealers quoting \$5.00 and under. Despite the declining prices no revival is apparent.

### POINTS IN WEEK'S MARKETING NOTES

Surface developments in the iron and steel market are of no importance, but important things are working cut under the surface.

Independents are not operating at over 20 to 25 per cent. of capacity. Steel Corporation's operations have dropped to about 60 per cent., against 90 per cent. early in January. Steel industry as a whole is operating at about 40 per cent. capacity.

Pig iron production is a little less than 50 per cent. of actual productive capacity. Prices for steel products have declined very little.

Wire nails have formed the most interesting price decline of the week. One company claims the reduction was made because two other producers were quietly doing so, although nominally quoting a higher price.

Pig iron prices in New England have shown a tendency toward a lower level during the week. Prices in castings have softened.

The scrap market is slightly weaker, although no change is registered in price. Where scrap is available, offers are so out of line with the ideas of the producers that the latter hold scrap in their yards for a rise in price.

Small tool dealers report that more inquiries are coming in, but that this is as far as it goes. Re-built tools are favorites at present. Improvement is looked for from now on.

There is a feeling that prices in steel will drop shortly. In fact, one dealer states he expects it hourly—"A substantial cut is what I expect," to use his own words.

### GOOD BUSINESS LOOKED FOR IN NEAR FUTURE

**TORONTO.**—There is a feeling of optimism throughout the trade generally, but while everyone is absolutely convinced that good times are ahead, they feel they are coming gradually and cannot be rushed in any way. In fact, it is the general opinion that more benefit will come if the improvement is gradual and steady.

One dealer expressed the view that small tools, etc., were just the same as

last week. He claims business is dull at present, but that things were in line for an improvement. Prices remain where they have been in the machine tool market, but there is a feeling that things are on the up-grade. In fact, one dealer stated that business looked very much better, and that there appeared to be a better feeling than there was last week. Quite a number of enquiries had been received during the last month. Actual business, however, is not so well advanced, as most people appear to be mostly writing for prices, etc. The general feeling, however, is that conditions will gradually improve from now on. Ontario is in a much better position than other provinces, and there are more enquiries and actual buying here than in any other province. American concerns locating here expect to do considerable business, and look favorably on the exchange rate, buying chiefly in Canada. They get much better value for their money, with the exception of special lines, some of which are not even procurable in this country. There is a marked tendency all over to enquire regarding machinery and equipment. Re-built or used machinery is in preference at present.

#### Steel Situation

Prices remain practically the same as last week. Conditions in other parts of Ontario are better than in the city here, remarks one dealer. Interest is very keen regarding the U. S. Steel Corporation, one gentleman stating that he was practically waiting for a reduction every hour. "When a cut does come," he said, "it will be a substantial one." Prices are being received from the independents that are much lower than corporation prices. As one dealer put it: "They are playing an old game, but it's too old to put over. It is only a question of time before they will have to give in." Another gentleman had this story to tell: "Prices and conditions are exactly the same as last week." Speaking of a possible reduction in U.S. Corporation prices he remarked that he would not even predict 48 hours ahead at the present time.

#### The Scrap Market

"Absolutely no change in the prices of scrap iron or pig." Briefly, this describes the situation. There is a distinct glut of metals of all kinds on the market, and according to one dealer, prices can hardly be lower than they are present. To his mind this is the proper time to buy. The steel and freight situation is demanding considerable attention and thought among those in the metal industry. When conditions get back to normal, some dealers claim that metals will be harder to get and more expensive. Practically all the larger plants have banked their furnaces, and only a very small percentage are operating to capacity.

A point that is retarding everything, according to one dealer, is the labor



situation in the United States. This, of course, is the dispute between the unions and the open shop. They all consider that Canada is 100 per cent. better placed as regards labor than the United States and that Quebec is perhaps best of any

province in this respect. Despite continued dullness, everybody is optimistic. Improvement is looked for round the middle or end of May. Taken in all conditions are better than they were last week.

## IMPROVEMENT IN DEMAND LOOKED FOR WITHIN THE NEXT FEW WEEKS

Special to CANADIAN MACHINERY.

**PITTSBURG, March 10.**—Surface developments in the iron and steel market are meagre and of no particular importance, but under the surface important things are working out.

Demand continues stagnant. The independents are booking scarcely any business with their cut prices. The Steel Corporation is not booking much business, but it is booking some. Its bookings are not due to its price or to the service it can render, as the independents will make lower prices and can give fairly prompt shipment. The corporation can usually beat the independents in promptness of shipment by a small margin, as the corporation has all kinds of departments in operation, while with an independent the shipment must frequently wait until enough orders accumulate to start the department involved. The chief reason the corporation is booking business is that consumers wish to secure, or retain, a place on its order books, after the spectacular example in 1920 of how much saving there was in having an allotment by the corporation.

### Operations

The common estimate is that the independents are not operating at over 20 or 25 per cent. of capacity. In January they operated at 25 or 30 per cent. The Steel Corporation's operations have dropped to about 60 per cent. against fully 90 per cent. early in January. Some decrease was certain to come, even if the price situation had not been disturbed, since the corporation's customers were in many cases receiving much more steel than they could distribute or consume, but the price-cutting by independents has sharply accentuated the decrease, causing many corporation customers to instruct the corporation to curtail or discontinue shipments. There is not much cancellation, however, and there is no buying from independents as a substitute.

The steel industry as a whole is operating at about 40 per cent. of capacity, against an average of 80 per cent. during the first nine months of last year. After all, the present rate is rather a high one, considering both the general stagnation in business and various other circumstances. There is, for instance, the item that rail production has been curtailed of late because the railroads are unable to pay for all the rails already shipped them thus far this year.

Pig iron production now is at the rate

of about 22,000,000 tons a year or at a little less than 50 per cent. of actual productive, not rated, capacity. On account of coke shortage and other difficulties the maximum rate attained last year was 40,000,000 tons, in March. Production has decreased much more by the merchant furnaces than by the steel works furnaces, being not over one-third of capacity, but the steel interests continue to curtail. The Steel Corporation is operating very much better than the independents, and of all the corporation subsidiaries the Carnegie Steel Company stands second in point of operation, yet of its 59 blast furnaces the Carnegie company at last report was operating only 38, against 48 about the middle of January, and additional furnaces are to be put out.

### Steel Prices

Minimum prices for steel products done by independents have declined very little, on the whole, in the past week. On ordinary orders bars are still quotable at 2c and shapes and plates at 2.10c, while there is less talk of its being possible to shade these prices materially in case a really good order was going. Sheets are commonly quotable at 3.20c for blue annealed, 4.10c for black and 5.25c for galvanized. These prices could be shaded on a sufficiently attractive order.

The most interesting price decline in the week is furnished by the action of the Pittsburgh Steel Company in quoting wire nails openly at \$3.00 per keg, base, against the regular or Steel Corporation price of \$3.25. Nails were regarded as being priced very closely at \$3.25, relative to other steel commodities, hence shading of the price is particularly interesting. When the Midvale Steel and Ordnance Company began cutting prices generally, about a month ago, it sold some nails at \$3.10, but afterwards announced that it had withdrawn the \$3.10 price. It is understood the Pittsburgh Steel Company maintains that it made the \$3.00 price because at least two other producers were quietly doing \$3.00, although nominally quoting \$3.25.

### Undercurrents in Steel

The United States Steel Corporation has not reduced its prices or wages, and no indication can be seen that it contemplates doing so in the near future. To many in the trade the Steel Corporation has seemed an enigma, and yet its action is not necessarily out of line with precedents and present conditions if these

are considered carefully. Thus, it has been the steel trade practice in the past that when prices are cut by some producers others follow and in a very short time the cut prices become the general market. The present, however, is an exceptional case. The mills used to cut prices when they could get business thereby. This time they cannot and probably they knew they could not. It is commonly believed that the cutting was done with the ulterior object of securing a "redistribution" of business and forcing the Steel Corporation to reduce wages, as practically all the independents have done. But there is no redistribution of business. The corporation has lost in shipments, but that is merely postponement. The corporation has not lost customers and independents have not gotten any business away from the corporation. As to wages, obviously the corporation cannot fairly reduce wages when it has not reduced prices. Its shipments are at the old prices, why should not wages be at the old rates? So the corporation does not seem to be as much of an enigma as is commonly thought.

In the past few days there is beginning to be observed an undercurrent of the independents being less disposed to continue their price-cutting course. Perhaps they are influenced by the extremely small amount of business secured thereby, and probably they are impressed by the Steel Corporation's calm refusal to be governed. Possibly they feel that if steel prices are once gotten down they cannot be gotten up again, as used to be the case. There will necessarily be an improvement in demand in the next few weeks, and later there will be much further improvement, even to a point of there being really a large demand, according to past standards, but that is a different thing from a demand equal to the present capacity, which is 50 per cent. greater than in 1914. In the past steel prices never advanced unless the mills were operating at 85 per cent. or more.

### Pig Iron

Foundry pig iron has been quoted and sold at \$26.50, valley, or 50c decline in the week. Bessemer remains nominally quotable at \$27, valley, and basic at \$25, valley, but one sale of a few hundred tons of basic has just been made at \$23, under somewhat mysterious circumstances. If it turns out that there is more iron to be had in the same quarter the quotable market will be \$23. Only four merchant furnaces in the Mahoning and Shenango Valleys are operating and some of them are thinking of going out, as they are piling up more iron than they are shipping.

The Hamilton Products, Ltd., has been incorporated with head office at Hamilton, Canada, and capital stock of \$1,500,000, to carry on the business of iron masters, iron makers, iron and steel converters, smelters, engineers, etc.



## Pig Iron Market

The pig iron market remains very dull and a base price of \$26 is now appearing. On the Philadelphia market the price of \$26 Eastern Pennsylvania furnace on No. 2 plain foundry iron (1.75 to 2.25 silicon) has appeared during the past week, but only in connection with live inquiries of 500 tons or more. No. 2 (2.25 to 2.75 silicon) on large inquiries has been quoted at \$27 and \$27.50. An eastern consumer is inquiring for basic, but is unwilling to pay higher than \$25, delivered, which is lower apparently than furnaces would do.

On the Chicago market foundry pig iron has been sold to a consumer in Wisconsin at a price which would figure back to \$24 Chicago furnace for 1.75 to 2.25 silicon. This iron is for March delivery to a maker of sanitary goods and involves 2,000 tons. It is understood that this iron was sold at \$26, delivered. Freight from Chicago is approximately \$2. Some inquiry is coming out, one calling for 250 tons of foundry iron and another being for 500 tons of low phosphorus iron, both for Chicago users.

The pig iron market at Cleveland continues to reflect the depressed condition among the foundries and sales are light. The American Radiator Co. has been the most active buyer, particularly for Detroit, but it has not been found that it has taken much tonnage direct from the furnaces. The main lots closed for Detroit appear to have been resale iron and these obtained from various sources in the week have exceeded 1,000 tons. In some of these cases it is reported that as low as \$25, Detroit, was done, but producers have been unwilling to meet this figure.

The low prices available on basic and bessemer pig iron on the Pittsburgh market does not appear to bring any measurable increase in buying of the steel-making grades. Some inquiries are before sellers, but mostly they represent only an effort of users to get a line on the market. Only a few sales are reported at \$25 and \$27, valley, respectively, involving from one to three carloads. The merchant interest which was first to establish the \$25 and \$27 levels and which reports closing on a fair proportion of the 16,000 or 17,000 tons figured on in February, states, however, that it declined a 3,000-ton order for basic offered at \$25, valley, less commission. It is selling iron only to its regular customers. Intermittent sales of foundry iron continue to be made.

While actual selling of pig iron on the New York market during the week has been limited to small tonnage, inquiry has improved to some extent, and in addition to numerous small lots includes one lot of 1,000 tons, another of 800 and one of 500 tons. All of these are for quick shipment, excepting the 800-ton inquiry. There is no assurance as to when

these inquiries will result in business. Foundrymen, however, are speaking more hopefully. Business prospects look better to them, and some of them that only a short time ago said they would need no more iron for a year or more are among those now inquiring. On Eastern Pennsylvania foundry iron the minimum price of the past week was \$27 furnace for 1.75 to 2.25 silicon, while in some cases this iron sold as high as \$30.

With the continued absence of consuming demand on the Boston market, pig iron prices in New England have shown a tendency toward a lower level during the week. A Rhode Island melter bought 100 tons of No. 2X (2.25 to 2.75 silicon) in two lots, including 50 tons from an Eastern Pennsylvania furnace at \$31.75, delivered, or approximately \$26.50 furnace. Foundries in general continue to melt about the same tonnage they were consuming a week ago. Prices in castings have softened.

Buffalo reports that the price on pig iron now is ranging from \$28 to \$30 base on sales of resale and furnace iron by furnaces. A broker sold 300 tons of No. 2 foundry (2.25 to 2.75 silicon) for \$28. This is equivalent to a base price of \$26.75. One interest sold about 2,000 tons, part of which was resale metal, at \$28 to \$29, and part of which was \$30 for the straight furnace No. 2 grade (1.75 to 2.25). Malleable inquiry is light.

Lower prices have brought out but little business and melters of pig iron continue buying from hand to mouth in the Birmingham district. General quotations for pig iron are on a level of \$27.50 for No. 2 foundry (1.75 to 2.25 silicon). It is reported that a 1,000 ton order was accepted under that figure and some business is known to have been closed at \$26.50 base.

## Scrap Metal Market

Dullness continues in the scrap market. Prices are generally weaker, although at Boston and Buffalo heavy melting steel advances. There is no buying worth speaking of on the Chicago market. Quotations at present are lower than the level attained early in 1919, which has been the record for several years, and while the bottom seems to have been reached, experience forbids prophecy as to the future.

The situation in Boston is sufficiently encouraging to create a slightly better interest among dealers. The price range is wide as buying is largely for storage purposes. Heavy melting steel which was \$9.50 the middle of February, is now better represented by \$10 as the large dealers are willing to pay this price. Mills are paying \$13 for rerolling rails but the future appears sufficiently encouraging to warrant some dealers paying as high as \$15 for storage. Four or five cars of No. 1 machinery scrap were sold to Massachusetts consumers at

prices ranging from \$23 to \$25, delivered, depending upon location.

New York reports that operations at the local scrap yards are somewhat better, as a result of open weather. However, they are far from active as buying continues virtually at a standstill. Heavy melting steel for eastern consumption continues at \$9.50 to \$10 f.o.b. New York, machine shop turnings \$8.50 to \$9; heavy cast \$18 to \$19, and machinery cast at \$19 to \$20.

The demand for heavy melting steel and forge scrap on the Philadelphia market has improved somewhat. Current buying involves only moderate sized tonnages, however, and the total is comparatively small.

The position of the market is weaker, though no change is registered in prices. This is due to the continued restricted operations of the Steel Corporation and the spasmodic operations of the independent companies. Where scrap is available, offers by bidders are so out of line with the idea of the producers, the latter decide to hold the scrap in their yards or bins for a rise in price.

On the Buffalo market during the past week, one mill was willing to pay \$14.50 for scattered tonnages of heavy melting steel, but the top price now offered is \$14. Little selling is being done and the market is really a nominal one. Mill operation has been reduced here and the scrap output is lighter.

With the exception of cast borings, a general decline in prices has taken place in the Detroit iron and steel scrap market. Heavy melting steel is down to \$10.50, heavy axle turnings to \$10, and machine shop turnings to \$5.

The southern market is still quiet, and dealers are uncertain as to when business will improve. The largest consumer of heavy melting steel in the Birmingham district, buying on the open market, is not operating its open-hearth furnaces.

## UPWARD TENDENCY RECOVERY BETTER

"There is a decidedly upward tendency, whereas, one month ago, we felt that the bottom was a long way down," declared a manufacturer to Canadian Machinery. As one interested in production work in forgings and stampings, he pointed out that while the slump in that particular line had been sharp and sudden, the recovery had been much more encouraging than expected. Some firms had suspended activities so completely last fall that they had made little or nor provision for a resumption that was sure to come with spring. Hence, there has been, during the past few weeks, quite an activity in small tools and other equipment, although it must be admitted this was short lived in some departments. The feeling in many quarters is that the turn had been made to the up-grade.



# SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

## PIG IRON

Grey forge, Pittsburgh .....	\$26 00
Lake Superior, charcoal, Chicago. 40 50	
Standard low phos., Philadelphia. 41 50	
Bessemer, Pittsburgh .....	28 96
Basic, Valley furnace .....	26 00
Toronto price:—	
Silicon, 2.25% to 2.75% .....	39 25

## IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto .....	\$ 4 50
Steel bars, base, Toronto .....	4 50
Iron bars, base, Montreal .....	4 25
Steel bars, base, Montreal .....	4 25
Reinforcing bars, base .....	4 50
Steel hoops .....	6 00
Tire steel .....	5 00
Spring steel .....	8 00
Band steel, No. 10 gauge and 3-16 in. base .....	5 50
Chequered floor plate 3-16 and heavier .....	7 50
Bessemer rails, heavy, at mill. ....	2 35
Steel bars, Pittsburgh .....	3 00-4 00
Tank plates, Pittsburgh .....	3 50
Structural shapes, Pittsburgh .....	2 45
Steel hoops, Pittsburgh .....	3 05
F.O.B., Toronto Warehouse	
Small shapes .....	4 50
F.O.B. Chicago Warehouse	
Steel bars .....	3 48
Structural shapes .....	3 58
Plates .....	3 78
Small shapes under 3-in. ....	3 48

## FREIGHT RATES

	Per 100 Pounds.	
Pittsburgh to Following Points	C.L.	L.C.L.
Montreal .....	58½	73
St. John, N.B. ....	84½	106½
Halifax .....	86	108
Toronto .....	38	54
Guelph .....	38	54
London .....	38	54
Windsor .....	35	50½

## METALS

	Gross	
	Montreal	Toronto
Lake copper ..	\$18 00	\$17 50
Electric copper ..	17 50	17 50
Castings, copper ..	17 25	18 00
Tin .....	37 00	40 00
Spelter .....	7 75	7 50
Lead .....	6 50	7 50
Antimony .....	8 00	8 25
Aluminum .....	34 50	30 69

Prices per 100 lbs.

## PLATES

Plates, 3-16 in. ....	\$5 25	\$5 25
Plates, ¼ up .....	4 75	4 75

## PIPE—WROUGHT

Standard Butt Weld Pipe		Per 100 Ft.	
		Steel	Gen. Wrought Iron
		Blk.	Galv.
1½ .....	\$ 6 50	\$ 8 50	\$ 9 11
2 .....	5 31	7 41	8 01
2½ .....	5 31	7 41	8 01
3 .....	7 10	8 63	9 43
3½ .....	8 80	10 87	12 02
4 .....	13 01	16 07	17 77

1½ .....	17 60	21 74	19 90	24 04
2 .....	21 04	25 99	23 79	27 84
2½ .....	28 31	34 97	32 01	38 67
3 .....	44 75	55 28	.....	.....
3½ .....	58 52	72 29	.....	.....
4 .....	74 06	90 62	.....	.....
4 .....	87 75	107 37	.....	.....

## Standard Lapweld Pipe

	Steel		Gen. Wrought Iron	
	Blk.	Galv.	Blk.	Galv.
2 .....	\$32 01	\$ 38 67	\$35 71	\$42 37
2½ .....	18 26	58 79	54 11	64 64
3 .....	63 11	76 88	70 76	84 53
3½ .....	75 90	92 46	85 10	101 66
4 .....	89 93	107 55	100 83	120 45
4½ .....	1 05	1 29	1 30	1 54
5 .....	1 22	1 50	1 52	1 80
6 .....	1 58	1 95	1 97	2 33
7 .....	2 06	2 53	2 53	3 01
8 .....	2 16	2 66	2 66	3 16
9 .....	2 49	3 07	3 07	3 64
10 .....	2 98	3 67	3 67	4 36
10L .....	2 77	3 41	3 41	4 05
10 .....	3 56	4 59	4 59	5 21

## Prices—Ontario, Quebec and Maritime Provinces

## WROUGHT NIPPLES

4-in. and under, 50 per cent.	
4½-in. and larger, 40 per cent.	
4-in. and under, running thread, 20%.	
Standard couplings, 4-in. and under, 20%	
Dd., 4½-in. and larger, net.	

## OLD MATERIAL

Dealers' Average Buying Prices		Per 100 Pounds.	
		Montreal	Toronto
Copper, light .....	\$ 9 50	\$ 9 00	
Copper, crucible .....	11 50	11 00	
Copper, heavy .....	11 00	11 00	
Copper wire .....	11 00	11 00	
No. 1 machine composition .....	10 00	9 75	
New brass cuttings .....	7 00	8 00	
Red brass turnings .....	8 00	8 00	
Yellow brass turnings .....	6 00	6 00	
Light brass .....	5 00	5 00	
Medium brass .....	6 00	6 00	
Scrap zinc .....	4 00	4 00	
Heavy lead .....	4 50	4 00	
Tea lead .....	2 00	2 00	
Aluminum .....	12 00	10 00	

	Per Ton	Gross
Boiler plate .....	\$11 00	\$12 00
Heavy melting steel .....	15 00	14 00
Axles (wrought iron). ....	25 00	20 00
Rails (scrap) .....	15 00	14 00
Malleable scrap .....	20 00	20 00
No. 1 machine cast iron .....	30 00	25 00
Pipe, wrought .....	8 50	8 00
Car wheel .....	30 00	25 00
Steel axles .....	20 00	18 00
Mach. shop turnings .....	8 00	6 00
Stove plate .....	23 00	20 00
Cast boring .....	5 00	7 00

## BOLTS, NUTS AND SCREWS

	Per Cent
Carriage bolts, 7-16 and up. ....	Net list
Carriage bolts, ¾" and less .....	15
Coach and lag screws .....	—20
Stove bolts .....	55
Wrought washers .....	—25
Elevator bolts .....	Net
Machine bolts, 7-16 and over. ....	—5
Machine bolts, ¾-in. and less. ....	—30
Blank bolts .....	Net

Bolt ends .....	—5
Machine screws, fl. and rd. hd., steel .....	27½
Machine screws, o. and fil. hd., steel .....	+25
Machine screws, fl. and rd. hd., brass .....	Net
Machine screws, o. and fil. hd., brass .....	Net
Nuts, square, blank .....	+25 add \$2 00
Nuts, square, tapped .....	add 2 25
Nuts, hex., blank .....	add 2 25
Nuts, hex., tapped .....	add 2 75
Copper rivets and burrs, list less. ....	27½
Burrs only, list plus .....	10
Iron rivets and burrs .....	37½ and 5
Boiler rivets, base ¾" and larger .....	\$8 50
Structural rivets, as above .....	8 40
Wood screws, O. & R., bright .....	67½
Wood screws, flat, bright .....	67½
Wood screws, flat, brass .....	55
Wood screws, O. & R., brass .....	55½
Wood screws, flat, bronze .....	50
Wood screws, O. & R., bronze .....	47½

## MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent
Set screws .....	Less 40%
Square and hexagon head cap screws .....	Less 30%
Round head cap screws .....	Plus 10%
Fillister head cap screws .....	Less 10%
Flat head cap screws .....	Net list
Button head cap screws .....	Plus 10%
Studs .....	Less 20%
Semi-finished nuts up to and including 1-in. ....	Less 35%
Semi-finished nuts 1½ to 1½ .....	Less 30%
Semi-finished nuts 1½ to 2 in. ....	Net list
Coupling bolts .....	Plus 10%
Taper pins .....	Less 40%
Planer bolts without fillet .....	Plus 40%
Planer bolts with fillet .....	Plus 50%
Patch bolts .....	Plus 80%
Hollow set screws .....	Plus 20%
Thumb screws .....	Less 35%
Thumb nuts .....	Less 65%

## BILLETS

F.O.B. Pittsburgh.

	Per gross wt
Bessemer billets .....	\$43 50
Open-hearth billets .....	43 50
O.H. sheet bars .....	47 00
Forging billets .....	48 50
Wire rods .....	57 00

## NAILS AND SPIKES

Wire nails, base .....	\$5 10
Cut nails, base .....	5 75
Miscellaneous wire nails .....	50%

## ROPE AND PACKING

Plumbers' oakum, per lb. ....	0 10½
Packing, square braided .....	0 38
Packing, No. 1 Italian .....	0 44
Packing, No. 2 Italian .....	0 36
Pure Manila rope .....	0 26
British Manila rope .....	0 20
New Zealand hemp .....	0 20

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Discount off list, Montreal and Toronto .....	Net
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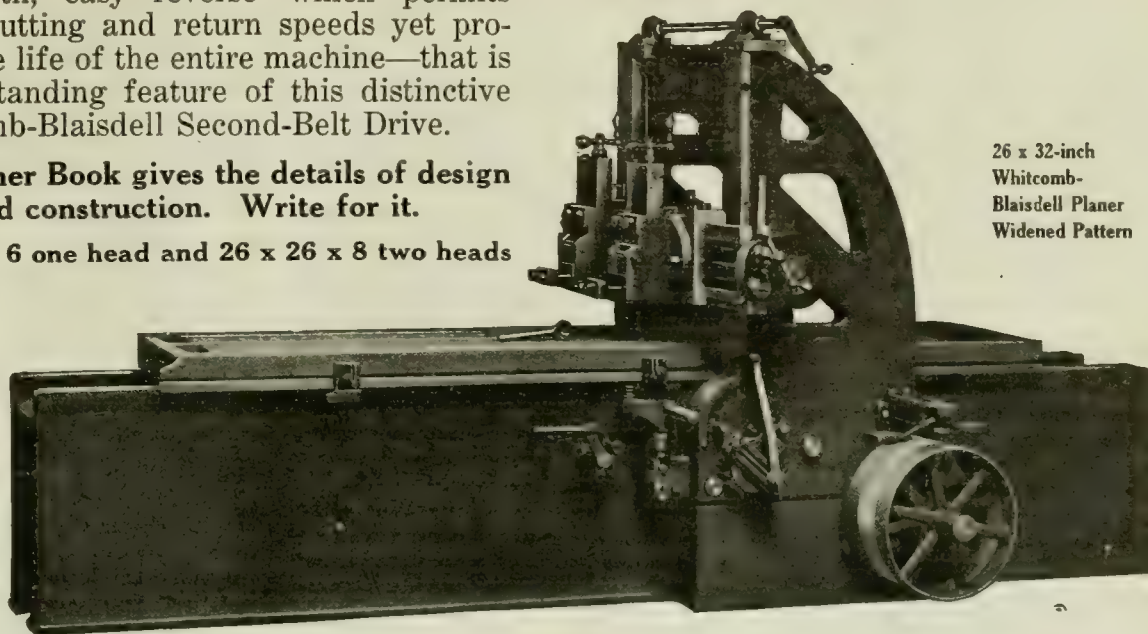


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# The Week's Events in Montreal Industry

E. A. Schofield, manager of Jones and Glasco, St. Nicholas Building, Montreal, who has been on a business trip to England for the past two months, is expected back in Canada early in April.

Edmund F. Conway, president and managing-director of the St. Lawrence Foundry Company, has been elected as a member of the board of directors of Canada Foundry and Forgings, Limited. Mr. Conway has been associated with the foundry business for many years.

Reconstruction of the plant of W. R. Cuthbert & Company is progressing with rapidity and it is expected that within a few weeks they will be able to resume operations. The changes to plant and equipment will make it one of the most modern of its kind in the district, and the improved facilities will add to the efficiency of production.

In order to meet the full requirements of users of the Armstrong-Siddeley cars, the Canadian agents, the Armstrong-Whitworth Company of Canada, 298 St. James Street, Montreal, have arranged to carry a complete set of repair parts at their Montreal warehouse. They have also secured the services of an expert from the works in England, who will be entirely at the disposal of the patrons of these cars.

The shipping firm of Furness, Withy & Company has purchased the Fraser building and site in Montreal and will remodel the building or rebuild the structure in keeping with other of their offices in other world ports. Plans have not yet been completed, but it is expected that the two first floors will be reserved for the shipping firm. The site of the new offices is at the corner of St. Sacrement and St. Alexis Streets.

Mr. Th. Seidl, chief engineer of the Escher Wyss & Company, Zurich, Switzerland, who arrived in Montreal last January to look after the interests of his company in Canada, is now on a trip to the principal Ontario points as a part of the survey he is making of conditions in this country for the Escher Wyss Company. The Montreal office of the company, which has been in the Coristine Building for some years past, has been moved to the Guarantee Trust Building, 285 Beaver Hall Hill.

Announcement has been made by the Department of Naval Service that the new direction-finding radio-telegraph station at St. John, N.B., has been opened for service. This is the fourth of the kind now in use by the Naval Service on the Atlantic coast. This station will be

known as the St. John station, but the actual location is on the east side of the harbor at Red Head, about four miles from the city. It will act in conjunction with the other finding stations, and in addition will serve the special needs of the Bay of Fundy, enabling ships to navigate this bay in safety in all weathers.

Walter P. Newman, secretary of the British Smelting and Refining Company, Drummond Building, Montreal, has just returned from a three months' trip to England in the interests of his company. He reports that the London organization is going strong, and brings a refreshingly optimistic viewpoint of conditions in the Old Country. Mr. Newman believes that things are on the turn for the better even though this may not yet be apparent to superficial observation. A hopeful spirit prevails in Britain, and Mr. Newman expects to see this condition of mind reflected here in actual business improvement in the very near future.

The importance and necessity of Imperial education was emphasized by Chas. R. Smith, of the London Times, at a recent meeting of the Canadian Association of British Manufacturers, held in Montreal. The theme of the address was "Think, trade and read Imperially." He stated that every home should read at least one empire magazine to keep in touch with its affairs; they should not attain that result by merely reading American journals. People did not yet realize the simplicity of it: there were many people talking of the independence of the Dominion, but now and then one should also think Imperially, and after that first step would trade Imperially.

T. H. Watson & Company, of Sheffield, England, announce that arrangements have been made with the General Combustion Company of Canada, Limited, New Birks Building, Montreal, to handle, build and sell their various electric smelting, melting and refining furnaces. The Canadian rights for the "Greaves-Etchells" type of furnace, which has been widely adopted in the United States and England, France and Spain, are also included in the arrangements made. The General Combustion Company is also taking over the designs of the Electric Furnace Construction Company of Philadelphia, on the various types of electrically heated core ovens, annealing and heat-treating furnaces, and will have the active co-operation of the American company on electric furnace problems generally.

In speaking before the annual meeting of the Quebec Provincial Council of the

St. John Ambulance Association last week in Montreal, Col. C. A. Hodgetts, of Ottawa, emphasized the necessity of establishing instruction classes in first aid to the injured in every factory or plant where there many employees. A resolution to the following effect was adopted at the close of the address: "That in view of the importance of first aid from an industrial standpoint, this meeting goes on record as approving the policy of organized classes of instruction in every factory or other establishment where a number of men and women are gathered together; and that regulations calling for first-aid certificates, with qualified attendants, should be incorporated in the Workmen's Compensation Act of the Province."

At the annual meeting of the shareholders of the Canada Cement Company, held last week, in Montreal, F. P. Jones, the vice-president and general manager, stated that business outlook for the coming year was more or less obscure. He thought that the activity in building trades this year would show an improvement over that of the past two years, but did not anticipate any marked boom. Summing up the prospects before his company, he stated: "I do not hold out any great hopes for an active business in cement in the near future. If our company secures enough business this year to warrant the running of our plants to within 60 per cent. of their capacity I think we shall be doing well." The company is contemplating the erection of a new ten-storey building on Phillips Square, and work on this will likely be started in the near future.

## BUSINESS BOOMING CREATES CONFIDENCE

Recent statements by company officials of the Canadian General Electric Co. to the effect that business was booming has created a fresh flurry, in so far as trading of shares are concerned. Nearly 700 shares changed hands on Saturday and for a stock of which the floating supply is known to be small, this was unusual, and seemed to indicate a good deal of faith or expectation on the part of traders. The president of the company, Senator Nicholls, having disposed of the rumor of absorption by the American General Electric, new theories for the demand were found. One who has watched the company's progress closely spoke guardedly of some favor which he expected would come to shareholders. In any case, he said the company had now orders on hand to keep the plants going for a full year.



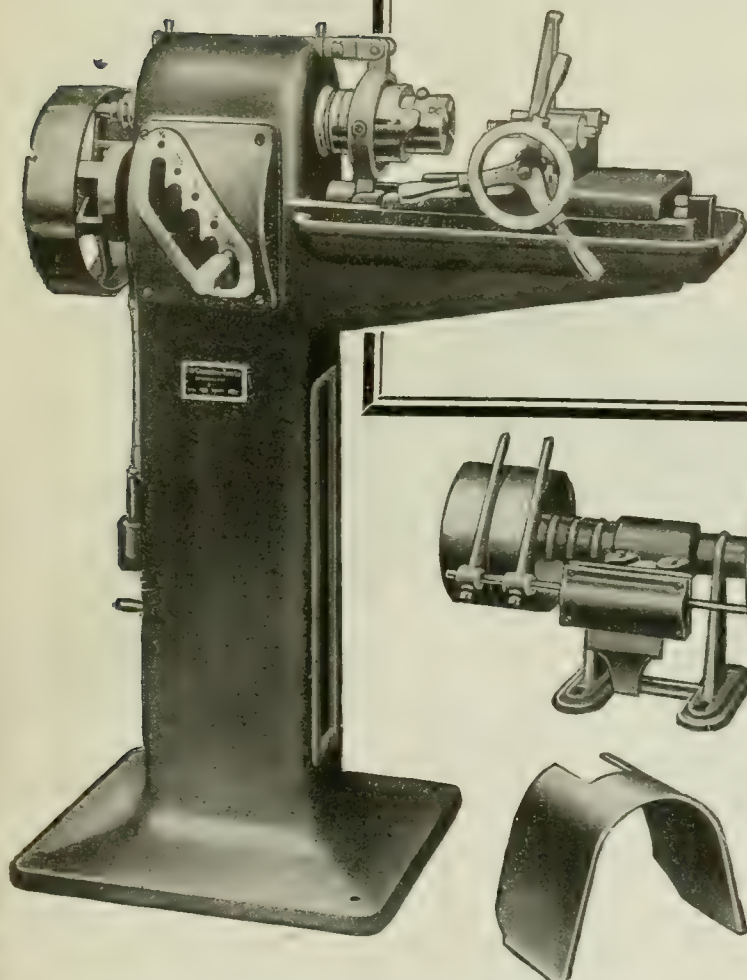
# THIS WAY, PLEASE

Where quantity and exactness have to be considered, the Geometric Threading Machine is just the way that suits. These machines have been tested and proved over and over again on speed, accuracy and endurance.

Geometric Threading Machines are employed on a large class of small threaded parts that cannot be produced economically on the ordinary screw machine.

Made in three sizes—to cut  $\frac{1}{8}$  to  $\frac{1}{2}$  inch,  $\frac{1}{4}$  to  $\frac{3}{4}$  inch, and  $\frac{3}{4}$  to  $1\frac{1}{2}$  inch diameter threads. The carriage is mounted on slides and on the largest size machine is moved back and forth by rack and pinion, and in the smaller sizes by hand.

Spindle speed changes readily made, adapting the machine to the diameter and material of the work. An adjustable stop assures accurate length of thread, and automatically opens the die head, permitting of drawing the work straight back.



*A line from you brings full details regarding this machine. Tell us your threading requirements—let us recommend the proper Geometric Collapsing Tap or Self-opening Die.*

## THE GEOMETRIC TOOL COMPANY NEW HAVEN CONNECTICUT

*Canadian Agents:*

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B., Halifax, N.S.  
Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.

*If interested tear out this page and place with letters to be answered.*





# INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS  
PERSONAL AND TRADE NOTES



## WOULD ADD REVENUE ADVOCATES 1 P.C. TAX

Such a Tax on Business Would Be an Improvement on Present Method, According to J. F. M. Stewart.

Speaking before the Chamber of Commerce at Stratford, Ont., J. F. M. Stewart, of Toronto, a member of the board of directors of the Dominion Steel Co., and of the Canada Steamships Limited, had the following to say on business conditions.

He advocated the abolition of existing methods of Dominion taxation and the placing in effect of a system of taxes of one per cent. on all business transactions. He produced figures showing that the revenue from business sources of the Government would be about \$160,000,000 under a system such as he suggests, or between \$30,000,000 and \$40,000,000 more than that derived under the present plan, and that the proposed plan would stimulate trade instead of stifling it.

Mr. Stewart was accompanied by his father-in-law, William H. Shaw, of Toronto, formerly of Stratford, who also spoke briefly to the meeting.

### Criticizes Tax System

Attacking the system of taxation used in raising money needed for war obligations, Mr. Stewart described the business profits tax and the income tax as unsound legislation, as in both cases it stifled business expansion and put a premium on the destructive system of simply investing money in bonds and letting it lie rather than developing and expanding business. In both cases it is an attempt to tax profits that may the following year turn into losses. He pointed out that the Government takes the profit on industry and the man takes the loss.

In place of the various present systems of taxation, Mr. Stewart suggested that a tax of one per cent. on the net turnover, or rather on all commercial transactions, should be collected by the last man handling goods before they reach the ultimate consumer. This plan, as before mentioned, would bring many more millions of dollars' revenue to the country, and would affect all equally, as the more a man spent the more taxes he would pay, and this would include the farmer as well.

## TECHNICAL MAN JOINS THE STAFF

Major F. H. Moody, B.A.Sc., Member A.S.M.E., Links Efforts With Automatic Electric Truck Company.

Powley and Townsley, Limited, with head office at 907 Excelsior Life Building, Toronto, have added to their staff Major F. H. Moody, who will act in the dual capacity of secretary-treasurer and chief engineer. This is another case where the technically trained man is



MAJOR F. H. MOODY, B.A.Sc., Mem. A.S.M.E.

coming into his own. This concern deal exclusively in a complete line of electric industrial and mine haulage equipment, battery charging and control apparatus, also Edison nickel-alkaline storage batteries.

Major Moody has had a varied experience that will prove both practical and useful in his new duties, an experience that will be of real worth to their already numerous clientele. Major Moody commenced his engineering experience in 1903 as machinist's apprentice with the John Inglis Co., Limited, Toronto. This was followed by mechanical and electrical engineering course at University of Toronto, for which he received his degree of bachelor of applied science (with honors) in 1909. His vacation periods were spent in practical work with the General Electric Company, Schenectady, N.Y., American Locomotive Company, Schenectady, N.Y., and International Steam Pump Company, East Cambridge,

Mass. Following a year as demonstrator in thermodynamics at the University of Toronto, he was successively associate editor Canadian Machinery, Power House and Canadian Foundryman, Toronto; associate editor Machinery, New York; Canadian Railway and Marine World, Toronto, until in July, 1915, he joined up with the 83rd Battalion for overseas service.

He served three years overseas with the 116th Battalion C.I.; with them he attained the rank of major. Returning to Canada with that unit in March, 1919, he became assistant chief engineer, McLaughlin Motor Car Company, Oshawa, relinquishing that position in January, this year, to assume the above new duties.

Major Moody intends to use his mechanical knowledge to the best advantage, viz., give advice that is based on experience. After all, this is the best kind of advice we can get, for all guesswork is eliminated.

## BUSINESS IS GOOD NO DECLINE LOOKED FOR

Factory Running to Full Capacity—New Equipment Necessary to Meet the Demand

In a recent letter to the trade in general the Williams Tool Corporation, Brantford, Ont., brings out some interesting points, the general trend of which follows:

"The increasing demand for our pipe machines has kept our factory running to capacity and made necessary the installation of several large new machine tools. This in the face of the present readjustment.

"Pipe manufacturers have their busy seasons the same as other lines of merchandise. During the war pipe machines practically disappeared from the market, but now it is a different story. January showed the second largest in the history of the company. Pipe machines will not decline in price for some time to come for the reason that the retail prices of these machines were not advanced in the same proportion to the present price of labor and material. We are even protecting dealers against a decline in prices just as long as machines purchased for stock purposes remain unsold."

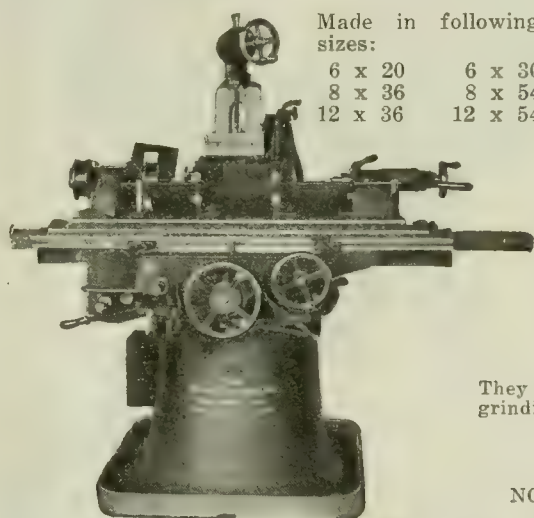


# GRINDERS

## FITCHBURG

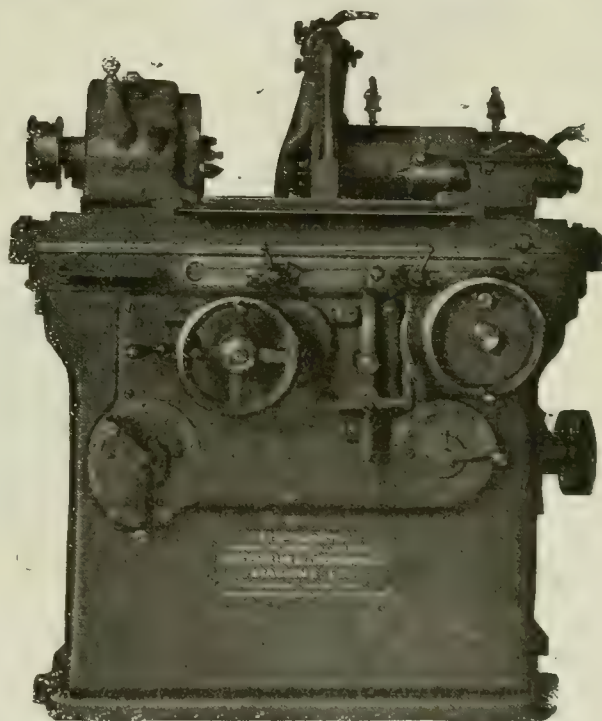
### Plain Cylindrical Grinders

Carefully designed to meet the great variety of cylindrical grinding requirements. Occupies just half the floor space of the larger cumbersome machines. Rigid and powerful. Constructed on the unit system, each unit being entirely independent of any other and can quickly be removed from the machine. Equipped with automatic feeds and arranged for motor drive on request.



Made in following sizes:

6 x 20	6 x 30
8 x 36	8 x 54
12 x 36	12 x 54



### BATH Universal Grinders

They will do your cylindrical, internal, surface, disc, tool and cutter grinding with speed and efficiency. Made in 3 sizes:

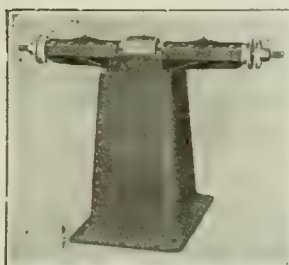
No. 1, 10" Swing, 20" between centres, Wheel 10x $\frac{3}{4}$ "  
 No. 2, 10" Swing, 25" between centres, Wheel 12x1 $\frac{1}{2}$ "  
 No. 2 $\frac{1}{2}$ , 10" Swing, 36" between centres, Wheel 12x1 $\frac{1}{2}$ "

NOTE—Bath No. 2 machine will grind surfaces 20 x 9, 7 $\frac{1}{2}$ " high.

### Tool and Cutter Grinders

Designed with the idea of combining strength and general utility with accuracy and easy operation, the Globe Universal Tool and Cutter Grinder is a machine which every Canadian manufacturer should include in his tool room equipment.

Centers swing work up to 8" diameter and 15" long.



### Other Grinders

Disc Grinders, Floor Grinders, Bench Grinders, Water Tool Grinders, Swing Grinders, Portable Pneumatic and Electric Grinders, etc., to meet requirements of any shop.

*Full Information may be secured from*

**GARLOCK-WALKER MACHINERY CO., LIMITED**

32 Front St. West TORONTO Telephone Main 5346

MONTREAL and WINNIPEG

# GARLOCK WALKER

HIGH GRADE MACHINE TOOLS

*If interested tear out this page and place with letters to be answered.*



## Trade Gossip

There has been sharp price-cutting among English and Scotch iron and steel makers, particularly in shipbuilding steel, in order to capture the overseas markets.

The Canadian rights for the "Greaves-Etchells" type of furnace, which has been widely adopted in the United States, England, Spain and France, are also included in the arrangement made.

The Zionist colonies in the Holy Land state that they intend modeling their power generating system after that of the style adopted in Ontario. Power will be drawn from the principal streams of Palestine, including the River Jordan.

Captain Joseph Hough, a navigator on Lake Erie for more than forty years, died at his home in Port Stanley March 7, aged 70 years. He was born in Port Stanley and had resided there all his life, sailing his vessel out of that port.

Mr. T. J. Dillon, who recently resigned his position of president and general manager of the Canadian Foundries and Forgings Co., Ltd., Montreal, will interest himself in the manufacturing of different lines of steel products in Welland, Ont., and the Niagara district.

The E. A. James Co., Ltd., the well-known consulting engineering firm, have changed their name to James, Proctor and Redfern, Limited. This change in name gives recognition to Messrs. Proctor and Redfern, who have been connected with the company for some years.

T. H. Watson & Company, Sheffield, England, announce that arrangements have been made with the General Combustion Company of Canada, Limited, New Birks Building, Montreal, to handle, build and sell their various electric smelting, melting and refining furnaces.

The General Combustion Company of Canada, Limited, are also taking over the designs of the Electric Furnace Construction Company, Philadelphia, on the various types of electrically heated core ovens, annealing and heat treatment furnaces, and will have the active co-operation of the American company on electric furnace problems generally.

Senator Frederic Nicholls, vice-president of the Dominion Steel Corporation of Montreal, recently resigned from his position on the board of directors of the corporation. Senator Nicholls states by way of explanation that increasing duties in Toronto makes it difficult for him to attend the meetings of the corporation at Montreal.

The death occurred of James Albert Cole, a well-known manufacturer of North Bay, on March 6. Mr. Cole for some years had conducted a successful planing business. For 25 years he was foreman of the J. R. Eaton Co., of Orillia,

and for the past year superintendent of the A. J. Young Lumber Co., of North Bay.

The Toronto Scale Co. have leased some available factory space in the building occupied by the MacFarlane Engineering Works at Paris, Ont.

The MacFarlane Engineering Works, Paris, Ont., are planning to extend their industry very materially by the production of a number of lines that have not been manufactured in Canada heretofore.

## Engineering

A new eight-roomed school will be built at Niagara Falls, Ont.

A factory at an estimated cost of \$25,000 is planned by Nelson Match Co., Nelson, B.C.

Plans are in preparation for the \$120,000 addition to the Brantford General Hospital.

Silverwoods, Ltd., London, Ont., are contemplating the installation of an ice plant with 25 tons capacity daily.

The Kamloops Canneries, Ltd., Kamloops, B.C., contemplate the erection of a fruit cannery costing \$5,000.

It is expected that work will begin shortly on the erection of the plant for the Wills-Lee Co., Sarnia, Ont.

A match block factory to be built at Nelson, B.C., is being planned by J. D. Martin, of Neepawa, Man.

Thomas Wollings & Co., Connaught Station, Ont., contemplate the construction of rolling mills at cost of \$60,000.

Application has been made by H. Savard, 124 Laurier Street, for permission to build a garage on Laurier Street, Montreal.

The erection of a building on the north-east corner of Spadina Road and Bridgeman Avenue is being planned by Langley's Limited at an estimated cost of \$20,000.

The general contract for the erection of factory to cost \$40,000 for Cridland and Sons, 1450 Gerrard Street E., Toronto, has been awarded A. Jeffries, Scarboro, Ont.

Provincial Government supplementary estimates for this year include, at cost of \$60,000 each, for erection of new Veterinary College and Dairy Building at the O.A.C., Guelph, Ont.

New tenders will be called by W. H. E. Schmalz, architect, 288 Frederick St., Kitchener, Ont., from March 15 to April 1, for the erection of service station at an estimated cost of \$15,000 for Reinhart and Doerr, 192 King Street west.

Cowie, and Moore, 50 Craig Street, Ottawa, have the general contract for the erection of garage costing \$18,000 for Drs. Liggett and Graham, 227 Clemow Avenue, and will receive tenders for gas tanks, Bowser pumps, roofing, electrical, plumbing and heating.

## Marine News

It was stated by P. A. S. Franklin, president of the company, that the agreement between the International Merchant Marine Company and the British Board of Trade, requiring the company to operate its ships without injury to British commerce applies only to British flag vessels.

The rumor that J. W. Norcross, president of the Canada Steamships, Ltd., would resign his office with this company, because he had been appointed as Canadian representative on the British Foreign Commercial Commission, has been denied by W. E. Burke, a director of Steamships.

A new wireless invention has been discovered by which ships may be guided during dense fogs, was announced by William Marconi at the British Shipmasters' Dinner. It is based on the principle that electric waves may be directed in any definite direction like flashes from a lighthouse. These waves would take the place of leading lights in thick weather and prevent collision of vessels during fogs. His invention has not been in operation anywhere yet.

It has been announced by Norman B. Conger, United States weather forecaster, that the radiophone will supplant the telephone and the telegraph in the distribution of weather forecasts from the United States Weather Bureau. Mr. Conger stated that the "radiophone" was being considered as a distributive medium. Storm warnings can be flashed to vessel masters at sea and vessel masters will be able to call up the weather office over the radiophone and get the very latest forecasts which will mean safety in sailing and no delays in taking of unnecessary chances by vessels.

That ice conditions in the Cabot Strait are the worst in ten years is reported by shipmasters who have succeeded in getting through the packs within the last few days. Newfoundland is reported to be entirely surrounded by impenetrable flocs stretching from the Arctic circle to the gulf and dotted with monster bergs. It is expected that the opening of navigation in Cape Breton ports will be much later than usual this spring.

## YORKSHIRE PRICES ARE BEING CUT

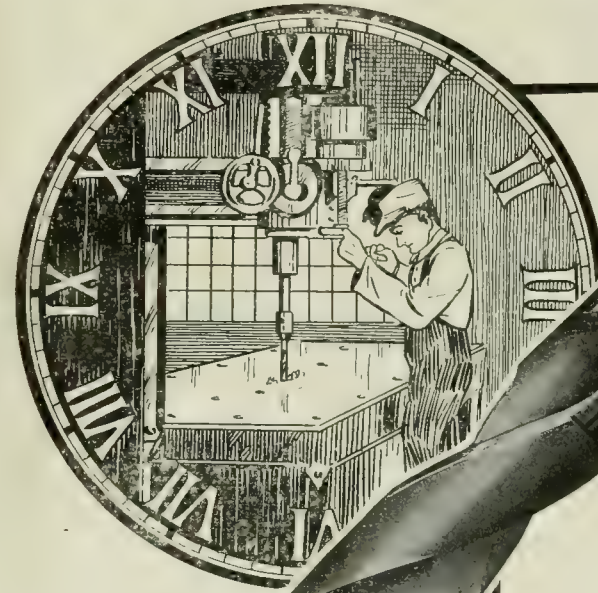
**Producers Make a Bold Attempt to Revive Interest in a Dull Industry.**

London.—The pig iron producers of the Cleveland district of Yorkshire, in order to make a bold bid for a revival of the industry, which is in a state of stagnation, have made a record cut in prices of all Cleveland pig iron amounting to 45 shillings a ton. East coast hematite has been reduced forty shillings and steel prices are expected to follow.



# MORROW

## High Speed Forged Drills



**T**IME is saved when you use Morrow High Speed Drills. The operator thins out the centre at the point and only has to regrind about half as often as with ordinary high speed drills.

Don't merely say "drills" when ordering. Say "MORROW." More holes with less regrinding!

Also manufacturers of cap screws, set screws, semi-nuts. Sole distributors of P-H and Imperial Brand Files.

Please Note Our New Montreal Address:

**John Morrow Screw and Nut Co., Limited**  
489 St. Paul Street West  
MONTREAL, QUE.

Telephone: Main 8418

*Works at* **INGERSOLL**

*If interested tear out this page and place with letters to be answered.*



## INFORMATION DESIRED REGARDING VARIOUS TYPES OF MACHINES

"We are interested in the establishment of a factory in Sydney for the manufacture of conduit for electric wiring." So writes one of our correspondents, and they continue their query in the following manner: "As you may be aware, a company in Melbourne is already engaged on this class of material, but we think there is room for a plant in Sydney. We require the fullest possible information on the following:

"First—Machine for manufacturing hot rolled steel strip into close joint conduit. Sizes at first would be  $\frac{1}{2}$  inch,  $\frac{5}{8}$  inch and  $\frac{3}{4}$  inch, or  $\frac{5}{8}$  inch size only. State shipping weights and measurements, also complete specification of machine, including output.

"Second—Machine for manufacturing steel strip into welded conduit. Sizes at first would be  $\frac{5}{8}$  inch and  $\frac{3}{4}$  inch, or  $\frac{5}{8}$  inch size only. State shipping weights and measurements. Also complete specification of machine, including output.

"Third—Rolling mill for rolling steel billets into strip of required gauge for  $\frac{1}{2}$  inch,  $\frac{5}{8}$  inch and  $\frac{3}{4}$  inch close joint; also  $\frac{5}{8}$  inch and  $\frac{3}{4}$  inch welded (this machine will probably be too expensive a proposition at first). State shipping weights and measurements. Also complete specification of machine, including output.

"Fourth—Screwing machine for screwing  $\frac{5}{8}$  inch and  $\frac{3}{4}$  inch welded. Alternatively for screwing  $\frac{5}{8}$  inch and up to 2 inch. State shipping weights and mea-

surements; also specification of machine, including output.

"Fifth—Sample and price of hot rolled steel strip for manufacturing  $\frac{1}{2}$  inch and  $\frac{5}{8}$  inch close joint. In coils suitable for cutting into 12 ft. 6 in. lengths. State gauge, width, and number of feet to the ton. State packing particulars.

"Sixth—Sample and price of steel strip for manufacturing  $\frac{5}{8}$  inch and  $\frac{3}{4}$  inch welded screwed conduit. In coils suitable for cutting into 12 ft. 6 in. lengths. State gauge, width, and number of feet to the ton. State packing particulars.

"Seventh—Samples and price of close joint conduit, rough, ready for enamelling, in  $\frac{1}{2}$  inch and  $\frac{5}{8}$  inch in 12 ft. 6 in. lengths. State gauge, and number of feet to the ton. State packing particulars.

"Eighth—Samples and price of welded conduit, rough, ready for screwing and enamelling, in  $\frac{5}{8}$  inch up to 2 inch, in 12 ft. 6 in. lengths. State gauge and number of feet to the ton. State packing particulars.

"We are anxious to purchase the most up-to-date plant available for the above industry and should be glad of all possible details regarding price, etc., making sure to state the best deliveries possible."

This is an ideal opportunity for manufacturers to send us in all possible information on the above queries, when we will forward the same to our correspondent without delay.

## DO ANY OF THESE LINES INTEREST YOU ?

Information regarding the following lines can be obtained by communicating with this paper and mentioning key number:

2758. Electrical goods, leather belting, rubber goods, etc.—A Turin house is willing to buy the foregoing articles in Canada.

2763. Machine tools, etc.—A very important Genoese firm would be disposed to negotiate with Canadian houses for machine tools.

2764. Machine tools.—A firm of import and export agents would like to enter into relations with Canada in the foregoing.

2766. Steel wire ropes.—A firm in Naples desires to hear from Canadian companies interested in doing business with Italy.

2769. Wire rope.—A Tokyo firm specializing in the import of British goods inquires for crucible steel wire rope of the following specifications:

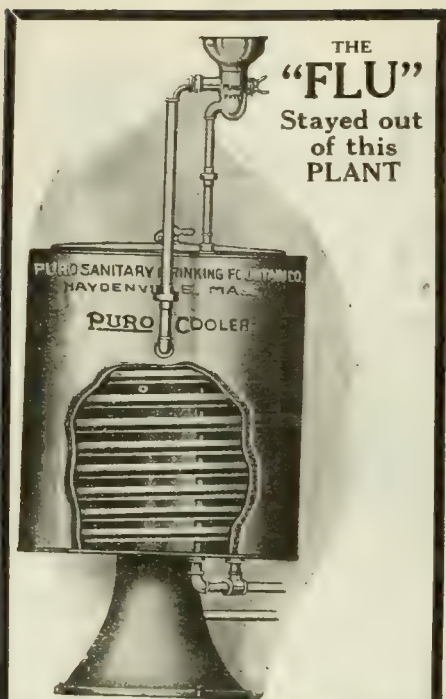
Crucible steel wire rope, No. 7 (quality), 6 strand.—Cir. 2,  $2\frac{1}{4}$ ,  $2\frac{1}{2}$ ,  $2\frac{3}{4}$ , 3 inches, 2,000 to 3,000 feet in length.

Crucible steel flexible wire rope, No. 24 (quality), 6 strand.—Cir.  $1\frac{1}{2}$ ,  $1\frac{3}{4}$ , 2,  $2\frac{1}{4}$ ,  $2\frac{1}{2}$ ,  $2\frac{3}{4}$  inches, 720 feet in length.

Samples and specifications are requested immediately.

2762. Representation in Australia.—Business gentleman at present in Toronto and returning to Australia would like to get into touch with manufacturers of millboard, suitable for shanks, toe-puffs, etc., in shoe and slipper manufactures. Kraft brown, sulphite and grease-proof papers, for paper bag manufacturing. Close-jointed tubing for bedsteads. Suspender and armband metal fittings. View to representation in Victoria, New South Wales, Queensland and South Australia.

The discovery of a method of utilizing volcanic iron sand for the manufacture of steel, which, if adopted, would make Japan independent of steel imports, has been announced by the Japanese War Office. Experiments were started some time ago with iron sand, of which there are unlimited supplies in the country, and tolerably good results were obtained from practical experiments at the Pen-chihu blast-furnace. Although the discovery is successful from a military point of view, any economic advantage does not necessarily follow.



### PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)

The only fountain with a bowl that prevents lips touching the bubbler paid its moderate cost over and over in all those well-ordered plants whose precautionary measures successfully barred the Spanish influenza. PURO saves lives, time and water. Write

**Puro Sanitary Drinking  
Fountain Co.**

888F St. Andre St., Montreal, P.Q.



### HAMILTON ENGINEERING SERVICE LIMITED

Consulting  
and  
Designing

Tools, Jigs, Fixtures and  
Special Machinery. Let  
us shoulder your pro-  
blems.

17 MAIN ST. EAST, HAMILTON

### DROP FORGE DIES

Send us your blueprints and specifications. Entrust your requirements to experienced workmen and up-to-date equipment. Have your dies made in Canada. First-class workmanship guaranteed.

THE KIMBER & HILLIER MFG. CO.,  
Thorold Road. - St. Catharines, Ont.



## WHO CAN SUPPLY HIGH TENSILE OVAL WIRE?

A correspondent writes as follows: We are desirous of forming connections with some well-equipped steel mill who are in a position to consider seriously the manufacture of galvanized high tensile oval wire, under the following specifications:

Size.	Close Joint S. W. G.	Screwed S. W. G.
1 1/2"	19	16
1 3/4"	19	16
2"	18	15
2 1/4"	18	15
2 1/2"	17	15
2 3/4"	16	14
3"	16	13

Paris Gauge	Resistance in Kilos.	No. of Bends.	Length of Coil in Meters.
19/17	1000	4	625
18/16	850	5	830
17/15	700	6	1120
16/14	650	7	1410

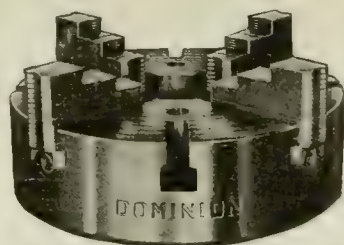
Coils of 45 kilos each, coils of one piece of wire, electrically welded where necessary, and coils are usually wrapped in heavy, tarred, weatherproof paper.

We have virtually controlled the sale of oval wire in South American markets for the past two years, and during that period we have secured orders amounting to approximately five thousand tons. The South American buyers have not been entirely satisfied with the oval wire which has been furnished them, and as we are desirous of holding the trade, which we have established, we are looking for a mill who could co-operate with us as per above specifications.

If you will kindly put us in touch with a mill who would be disposed to enter into the manufacture of this material, we would then submit our proposition in detail and could probably offer the same volume of business. How about this? Who can give us this information?

### IMPORTANT TESTS

Tests carried out by the United States Bureau of Standards on the value of slags for fine and coarse aggregate indicate that the concrete so made seems to be of an equal strength with concrete made from ordinary gravel. The conclusions of the Bureau are as follows: Crushed slag as a coarse aggregate produced concrete of as high a strength as gravel. The tests were not extensive enough to determine the durability of the slag, but to the extent of the tests there were no signs of disintegration due to the sulphide sulphur or other causes. Slag sand, because of its lack of fine material, does not produce easily workable concrete when used as a fine aggregate. If it must be used its working qualities can probably be improved by the addition of small amounts of fine sea sand, hydrated lime, or other fine material. Provisions in specifications for slag aggregate calling for a maximum sulphide content of 1.5 per cent., and a minimum weight per cubic foot of 70 pounds, are tentatively recommended.



## DOMINION CHUCKS

STEEL OR CAST-IRON BODY  
BUILT FOR HEAVY DUTY



### All Screws Are Reversible

**S**CREWS are made of the best grade steel. Both ends are broached and are heat treated after machining. They are reversible, so that either end may be used, are large enough in diameter to stand the torsional strains applied by operator when setting up his work. They are made to give the best service—and may be depended upon to stand up under the hardest usage.



**DOMINION STEEL PRODUCTS CO. LIMITED**

Engineers • Manufacturers  
BRANTFORD, CANADA

### OAKOAL CO. IN LIQUIDATION

The Oakoal Co. has gone into voluntary liquidation. A statement issued by the company says that although not in a state of bankruptcy, the present financial depression made it difficult to collect on stock subscribed, which approximates the amount the company owes. E. R. C. Clarkson & Sons have been appointed receivers.

The statement adds that "the company has for the past three months been making anthracite briquettes and will continue to do so. The idea of going into voluntary liquidation is simply to give ample time for reorganization, collection of outstanding subscriptions and meeting all obligations."

### CATALOGUES

The Cincinnati Electrical Tool Co., Cincinnati, O., have recently issued a new catalogue No. 14, covering their complete line of Portable Electrical Drills, Grinders and Buffers. This catalogue contains several new type machines which the company recently brought out, and should prove of interest to anyone using or intending using such equipment.

#### NEW CATALOGUE

The Williams Tool Corporation, Brantford, Ont., and Erie, Pa., have issued a loose-leaf catalogue dealing with their complete line of pipe threading and cutting machines. It is also descriptive of the Williams patent receding die head designed to cut straight or taper threads of any degree to any length. The Corporation is al-

so issuing a monthly delivery sheet, listing machines and motors that are immediately available.

#### PRESS BOOKLET

The Baird Machine Co., Bridgeport, Conn., have issued a booklet dealing with their double action tandem press. Examples of work performed are shown and it is stated that the press, when equipped with simple tools, will automatically feed the metal to the front press, pierce, stamp, letter or do any such follow-up work, blank, hold down the blank and draw, then transfer to the back press and redraw, pierce, stamp or perform any operation that might be carried out in a single action press. Tumbling barrels are depicted in the latter part of this booklet.

#### CLUTCH CATALOGUE

The Hanson Clutch & Machinery Co., Tiffin, Ohio, have issued a catalogue No. C 3 which deals with their line of friction clutches. Different styles and sizes are shown, also typical installations. The book is in itself a regular text book on the subject of this type of clutch.

#### DRILL PRESS BOOKLET

The Aurora Tool Works, Aurora, Ind., have issued an attractive booklet on their line of upright drills. The different styles as manufactured are shown with complete specifications, and the various features are explained in detail. The booklet is of loose-leaf construction and can be added to as the line grows.

#### NEW FOLDER

The Canada Machinery Corporation, Galt, Ontario, have issued a rather interesting folder entitled "Cut Your Costs." The interior of the circular shows various machine tools manufactured by this concern, and tells of various features embodied in the same. An invitation is also issued to visit their works and see the facilities they have for machine tool building.



# Classified Opportunities

## HELP WANTED

WANTED AS ASSISTANT EDITOR. ON group of technical papers, live-wire mechanical engineer. Qualifications required are: Age, under 45; good education; certain amount of practical experience; ability to express ideas on paper; good mixer and aggressive worker. Splendid opportunity for the right man. State full particulars in first letter, mentioning present salary. Box 152, Canadian Machinery.

WANTED - SHAPER MAN, ALSO MILLWRIGHT; state wages, experience. Box 758M, Canadian Machinery.

## MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (ctfm)

## MACHINE WORK WANTED

We are equipped to handle all kinds of general or special machine work. All operations in our plant are done under the most careful supervision and we can satisfy you as to price. Always available for consultation.

**PERFECT MACHINE COMPANY, GALT**  
Builders of Reliable Machinery.

## Grey Iron Castings

Light and Medium-Bench and Floor Repetition Castings. Capacity 15 tons per day. Expert Metal and Wood Pattern Work. Our advice and estimates will save you money. Semi-finishing operations on Lathe or Grill on Castings supplied if required.  
ASK US.

**THE KATIE FOUNDRY, GALT, ONT.**

## PARTIAL LIST

### Machine Shop Equipment At Extremely Low Prices

LATHES All sizes and lengths of bed. Special price quoted on rebuilt 20 in. x 8 ft. C.M.C.

AIR COMPRESSOR—8 in. x 8 in. Chicago Pneumatic.

TANKS—10 Tanks 10 ft. 6 in. diam. x 29 ft. 6 in. long. 19,000 gals.  
3 Tanks, 10 ft. 0 in. diam. x 39 ft. 0 in. long. 25 in. Heads. 22,593 gals.

Full line of other Steel Storage Tanks, open and closed, all sizes.

PUMPS—1 Triplex Power Pump, 1½ in. x 6 in. Hydraulic Machy. Co. Also 1 in. x 5 in. West Tire Setter.

1 Centrifugal Pump, 2½ in. x 1½ in. Gould.

1 Gould Triplex Power Pump, 2 in. x 3 in.

Milling Cutters and Reamers, full assortment, all sizes and shapes, at less than half price. Send us your enquiries.

### Standard Equipment & Tool Works

Dept. K. 307 St. James St.  
Main 2286 MONTREAL (20)

## POSITIONS WANTED

POSITION WANTED—MACHINE SHOP SUPERINTENDENT or general foreman. Acquainted with modern machine shop practice and heat-treatment of steel. Thirty years' experience. Production or contract work. Box 757, Canadian Machinery.

## FOR SALE

2—FARREL JAW CRUSHERS—12" x 20".

1 ARMINGTON-SIMS STEAM ENGINE, 450 h.p.

1—LEONARD STEAM ENGINE—100 h.p.

1—VERTICAL BOILER 36" x 8'—110 LBS. w.p.

Box 762F, Canadian Machinery.

BELTING, CORDWOOD SAWS, NEW CROSS-cut saws, thirty-inch at \$9.50; twenty-eight-inch at \$8.50; new rubber belting, six 4-ply at 50 cents; five-inch at 45; four-inch at 35. Box 759F, Canadian Machinery.

WE HAVE IN STOCK FOR IMMEDIATE DELIVERY new and second-hand electric motors: 3-phase, 25-cycle, 550-volt, 1 h.p. up to 75 h.p. Box 761F, Canadian Machinery.

THREE 50 H.P. TYPE C.C.L., TWO 50 H.P. type H.S.; Westinghouse motors, one 30 h.p. and one 32 h.p. and one 40 h.p. Chapman-Walker motor; twenty 16 in. Bliss turret lathes and eleven No. 2 Foster turret lathes, nine No. 3 Foster turret lathes, two 14 in. Warner & Swasey lathes, two No. 6 Warner & Swasey lathes, one No. D1 Colburn drill press, eleven No. 1 Burke hand millers, and one 68N Bliss press and one 57½ Toledo press, one hydraulic accumulator, two No. 55 National Acmé automatics; also various other lathes, millers, pumps, hardness testing machines, etc. Apply Box 760F, Canadian Machinery.

## Modern Marine Machinery

Automatic Steam Towing Machines, Ship Windlasses, Cargo and Deck Winches, Steam Capstans, Dock Gypsies, Steering Engines, Hydraulic Freight Hoists, etc. Grey Iron and Brass Castings. Special machinery built to order. The Corbet Foundry & Machine Co., Limited, Owen Sound, Ont. (52)

## REGO WELDING and CUTTING APPARATUS

Oxygen, Acetylene, and a complete line of Welding and Cutting Supplies.

**Carter Welding Co.**  
of Toronto, Limited

7-11 Sheppard St., Toronto, Ont.

Phones: Adelaide 2841 and 1524 (TF)

## PATTERNS

TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (ctfm)

BRANTFORD PATTERN WORKS ARE PREPARED to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell Phone 631; Machine Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

## MACHINERY WANTED

WANTED—NEW AND RE-MANUFACTURED gas and gasoline engines, boilers, saw-mill machinery, planing mill and sash and door factory machinery. New and manufactured iron and wood-working machinery. Electric motors, dynamos, direct connected steam operated generators, portable electric tools. Builders' hoists, elevators. Box 739F, Canadian Machinery.

IF YOU HAVE IRON-WORKING OR WOOD-working machines for sale, or idle machine shop equipment, call or write Canada's largest dealers in new and used machinery. H. W. Petrie Limited, Toronto, Ont. (ctfm)

ONE SINGLE STAND 9 x 18 ROLL IN GOOD condition; one receiving separator, capacity about 1,000 bushels per hour. Crane Bros., 817 Ferry St., Niagara Falls, Ont.

## Machinery Wanted

Advertisements under this heading will be inserted once free of charge. Readers are invited to use this department when in need of equipment. Replies may be sent to box number, care of Canadian Machinery, if desired.

## CANADIAN MACHINE SHOP

Will handle medium  
Specialty Line —  
Manufacturing and  
Selling

Apply Quickly

Box No. 715F

CANADIAN MACHINERY



# Classified Opportunities

## ATTENTION! JOBBERs and DEALERS Engineering Supplies

There is absolutely no reason for paying exchange on your purchases of asbestos packings, gaskets and tape. We manufacture a line that is equal to any imported article and sold to jobbers at a price that allows a good margin of profit with protection. If you are not handling our line you are working at a disadvantage. Write us for set of samples, circulars and prices.

### OUR LINE INCLUDES :

Tiger Superheat  
Metallic Piston  
Packing  
Tiger High Pressure  
Piston Packing  
Flax Packings  
Asbestos Gaskets  
Asbestos Tape



**GUILDFORD & SONS LIMITED**  
HALIFAX, N.S.

## NOW IS THE TIME TO BUY SHAPERS

16" Rae (new)

14" Davis, S.G.

These shapers are furnished with  
cone pulley, table support and vise.

## WOODWORKING MACHINES

1 12" Cowan, late type, square head.

1 No. 93 Berlin Sticker and Matcher,  
4 heads, complete except for jointer  
grinding attachment.

The above are only a few items  
from our large stock of new and used  
machines. Further information on ap-  
plication.

**R. S. HOLLY**

*Suit 502 Kent Building*

TORONTO, Ont., Adelaide 3147



### 1 1,333 KVA. WESTINGHOUSE-PARSONS CONDENSING TURBO UNIT.

**Generator**—1,000 kw. (or 1,333 kva.),  
80% P. F. Westinghouse, 3-phase, 60-  
cycle, 2,300 volt, 335 amp., 1,800  
r.p.m. Direct coupled on common  
base to:

**Turbine**—Parsons three or four stage, de-  
signed for 150 lb. steam, parallel flow  
1,800 r.p.m.

**Condenser**—Westinghouse LeBlanc, low  
level jet. With Pumps and Switch-  
board.

Have just purchased the above and will make an  
exceptionally attractive price prior to removal from  
power house where it is now located at Cleveland,  
Ohio. Excellent condition in every respect.

## MacGOVERN & COMPANY, INC.

285 BEAVER HALL HILL, MONTREAL

Offices: New York, Pittsburgh, Seattle. Plant: Linden, N.J.  
Buyers and Sellers of New and Used Machinery

## STOCK SHIPMENTS

## COLD ROLLED STRIP STEEL

### Deep Drawing, No. 4 Temper

10,000 lbs. .028" x 2 7/8" x 6' lens.	2,000 lbs. .050" x 1 3/4" x 7' lens.
2,000 lbs. .028" x 4" x 8' lens.	3,400 lbs. .050" x 4" x 8' lens.
7,000 lbs. .028" x 6" x 8' lens.	6,200 lbs. .050" x 5 3/4" x 8' lens.
1,500 lbs. .028" x 8" x 8' lens.	4,800 lbs. .050" x 6" x 8' lens.
2,400 lbs. .032" x 4" x 8' lens.	6,500 lbs. .062" x 6" x 8' lens.
6,300 lbs. .032" x 8" x 8' lens.	3,800 lbs. .062" x 8" x 8' lens.
500 lbs. .035" x 6" x 8' lens.	18,000 lbs. .062" x 13" x 140" lens.
2,000 lbs. .035" x 8" x 8' lens.	6,500 lbs. .065" x 6" x 6' lens.
	700 lbs. .073" x 6" x 8' lens.

The above all suitable for nickel building work. These  
items comprise only a few of the sizes we carry, and  
other material available for immediate shipment. Com-  
plete stock lists sent on request.

## STEEL TUBING

WELDED

FLEXIBLE

SEAMLESS

## AUTO BODY SHEETS

Black and Galvanized Sheets, Brass  
and Copper Sheets, Rods, Tubes

*Send Us Your Enquiries*

## ONTARIO METAL PRODUCTS CO., LIMITED

237 Dufferin St., TORONTO, Canada



## GENUINE EMERY

Sizes 180, 160, 140, 120, 110, 100, 90, 80, 70, 60, 51, 46, 40, 36, 30, 24, 20, 18, 16, 14, 12, 10, 9, 8, hole.

### EMERY FLOUR AND WASHED FLOUR

Emery		In
Glass		
Flint		
Garnet		
Corundum		
Carborundum		
	Paper	Sheets, Rolls,
	and	Discs, Bands,
	Cloth	Strips and
		Tapes, &c.

## JOHN OAKLEY & SONS

LIMITED

WELLINGTON MILLS  
LONDON, S.E. 1, ENGLAND

AGENTS:

F. Manley, 343 Garry St.  
Winnipeg, Man.

Sankey & Mason  
839 Beatty St., Vancouver



Manufacturers:

## The Sheffield Twist Drill & Steel Co., Ltd.

Works: Summerfield Street, Sheffield.

To PROMOTE TRADE within the EMPIRE, CANADIAN MANUFACTURERS will find that "DORMER BRAND DRILLS" meet all requirements. QUALITY DRILLS for quick drilling—USE "DORMER."

Sheffield Engineering Supplies,  
Limited,  
230, Craig Street West,  
Montreal, Canada.

## High Speed Twist Drills



DORMER BRAND

REG. TRADE MARK  
**TRAHERN**  
REG. U.S. PAT. OFF.

### Coolant Pumps Are Superior

first, because the working principle is correct. They are Rotary Geared and this type has not been surpassed since it was first designed, in the sixteenth century.

They will pump water, oil, or compound in heavy streams without pulsation. No loss of prime. Reverse with machine, work against 100 lbs. pressure, supply up to 16½ G.P.M. Run at low speeds, giving long life.

We shall gladly send our illustrated booklet giving details.

### TRAHERN PUMP DIV.

Geo. D. Roper Corporation  
ROCKFORD, ILL., U.S.A.



## Don't Keep It--Sell It!

If you have a lathe  
a drill  
a milling machine  
a planer  
a chain block  
a chuck  
a motor  
a crane  
a stock of belting  
an engine  
a compressor

or any other machine shop equipment for which you really have no further use, why not turn it into cash?

Someone may be looking for just the machine you may want to sell. Let us bring you together.

A "classified" ad. in CANADIAN MACHINERY, costing a few cents per issue, has done wonders for others. Why not try it?

Turn to the "Classified" section in this issue and see what is being offered and what is wanted at present.

## CANADIAN MACHINERY

Classified Advertising Section

143-153 University Avenue TORONTO, ONT.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.



# HOYT


**BABBITTS—METALS—SOLDERS**

**HOYT METAL COMPANY**

MONTREAL

TORONTO

WINNIPEG



**Increased Output  
and  
Lower Operating  
Costs**

follow the use of  
**P.H. and IMPERIAL  
FILES.**

*"They Cut Faster and  
Wear Longer."*

**Be File-Wise.**

**INGERSOLL FILE COMPANY,  
LIMITED.**

John Morrow Screw and Nut Company  
Limited,  
Sole Distributors,  
Ingersoll, Ontario.

**INGERSOLL**

## STEEL CASTINGS

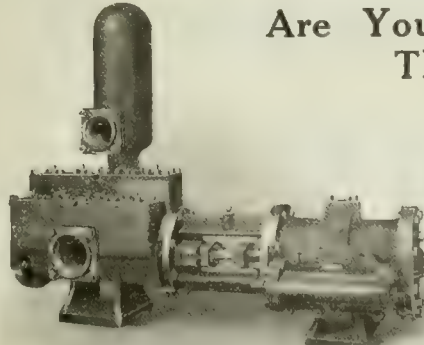
**QUICK  
DELIVERIES**

**High Carbon Steel  
Manganese Steel  
Chrome Steel  
Mild Steel**

**QUALITY  
GUARANTEED**

Sizes— $\frac{1}{2}$  lb. to 5,000 lbs. each

**THE WILLIAM KENNEDY & SONS,  
LIMITED**  
OWEN SOUND, ONTARIO  
ESTABLISHED 1860



**Are You Looking for a Steam Pump that's Better  
Than the Ordinary? Then take Note of this**

## HEPBURN

In the Hepburn Steam Pump the steam chest is located on the side of the cylinder and the low ports automatically drain away all condensation. This prevents water hammer in the cylinder and ensures a perfect cushion for the steam piston.  
The Hepburn is the **only** self-draining

Pump made in Canada. There are no levers or tappets to get out of order. You will find our prices right.

We also make: Vertical Engines, Compressors, Wirelows, Cut Gears, Drums, Brice Machinery, Hydrants, Blacksmith Work, and Grey Iron Castings.

**JOHN T. HEPBURN, LIMITED** ENGINEERS AND  
IRON FOUNDERS  
18-60 VAN HORNE STREET, TORONTO, CAN.



# George Ham says "Good-Bye"

A STRIKING and affectionate farewell is bade by Col. George H. Ham in the March 15th issue of MACLEAN'S MAGAZINE, to his thousands of friends, as well as to other readers who may know him only by hearsay, who have been following his reminiscences in Canada's National Magazine since last August.

"The Curtain is Rolled Down, for seventy-three years makes a long act," says George. "Recalling three score and ten of these years has been a pleasant though difficult task; thirty-three of them have been spent in the service of the C.P.R., and one cannot but realize that the corridors of the Company's office will not long be trodden by the older ones of this generation and that some of us perhaps will soon not even be a memory."

## "There Were Giants in Those Days"

The concluding instalment of this remarkable, all-Canadian feature, is the biggest and best of the lot—and here is the proof: There are seven full magazine pages, chock full of stories of those amazing days when the C.P.R. was conceived and constructed; human, hitherto unpublished details of the lives and careers of those three veteran founders, and, later, presidents of our first transcontinental: Lord Mount Stephen, the late

Sir William Van Horne, and Baron Shaughnessy, K.C.V.O. And funny stories! Well, just read about Baron Shaughnessy's racing experiences; the pranks George Ham and William Stitt used to play on each other; Fred Cook's "German Band," and countless other incidents that could only be retained in such a mind—and heart—as that possessed by Canada's grand old raconteur.

## Big Features of Fiction and Fact

### "Personality, Plus"—By Guy Morton.

A fascinating story about an advertising agency man who put across a trick to close a contract—and then gave the whole game away.

### "Lenix Fools the Jinx"—By Archie P. McKishnie.

Another of those deliciously droll Lenix Ballister negro stories, in which more than the usual number of comic and absurd scenes are depicted.

### "Pawned"—By Frank L. Packard.

The third instalment of this masterful serial goes a long way to show how the triple regeneration is going to be effected.

### "Broadway to Brussels"—By C. C. Jenkins.

The story of the rise of J. H. Gundy, a shy youngster, who developed into one of Canada's most brilliant orators and a leading financier.

### "Little Bundles of Pluck"—By Agnes C. Laut.

In this, Miss Laut tells with graphic pen the story of some of the war brides who are making good out on the lonely prairies, where they and their husbands have been located by the S.S.B.

### "A Woman Would Know —"—By Charles G. Booth.

This whole gripping story centres around the possession of a wee bundle of humanity, cursed with a dope-fiend father. There is plenty of love interest, too.

### "Those Who Stood in Darkness"—By J. L. Rutledge.

A symposium giving the opinions of a number of Ministers of various denominations on some of the doubts which have arisen in this war aftermath, in the minds of many Christians—and others. An Easter Message.

## Review of Reviews

"What Does Future Hold for Mankind?"  
H. G. Wells

"The World's New Leaders."  
Sir Philip Gibbs

"Labor Espionage in the U.S."  
Sydney Howard

"Bismarck's Account of Dismissal."  
Neue Züricher Zeitung

"Ireland, the Enemy?"  
Harold Cox

"Devil Duval's Treasure."  
Chambers's Journal

"A Winged Torpedo Boat."  
"Tin-Fish"

"How Van Horne Rose."  
Walter Vaughan

"Criminal Tribes of India."  
London "Times"

"Salvaging Submarine Victims."  
Stuart Martin

"Greece's Great Renunciation."  
Pierre de Lacretelle

"Labor Must be Partner."  
George A. Greenwood

"Common-Sense Bridge."  
Manning Foster

**MARCH 15th ISSUE On All News-stands 20c**

**MACLEAN'S**  
"CANADA'S NATIONAL MAGAZINE"



# Canadian Machinery BUYERS DIRECTORY

If what you want is not here, write us, and we will tell you where to get it. Let us suggest that you consult also the advertisers' index—last page of book, after having secured advertisers' names from this directory. The information you desire may be found in the advertising pages. This department is maintained for the benefit and convenience of our readers. The insertion of our advertisers' names under proper headings is gladly undertaken, but does not become part of an advertising contract.

## Abrasive Discs

Norton Co. of Can., Ltd., Hamilton, Ont.  
Oskey & Sons, Ltd., John London S.E., Eng.  
Ritchey Supply Co., Toronto, Ont.  
Wausau Abrasives Co., Chicago, Ill.

## Abrasive Materials

Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.  
Norton Co. of Can., Ltd., Hamilton, Ont.  
Oskey & Sons, Ltd., John London, S.E., Eng.  
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.  
Ritchey Supply Co., Toronto, Ont.  
Wausau Abrasives Co., Chicago, Ill.

## Acetylene, Dissolved

L'Air Liquide Society, Toronto, Ont.

## Accumulators, Hydraulic

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.  
Stewart & Co., Dundee, Glasgow, Scot.

## Air Lifts

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.  
Holden Co., Ltd., Montreal, Que.  
Independent Pneumatic Tool, Chicago, Ill.

## Air Purifiers and Coolers

Sturtevant Co., B. F., Boston, Mass.

## Analyses, Chemical

Toronto Testing Laboratory, Toronto, Ont.

## Angle Bars

Steel Co. of Canada, Ltd., Hamilton, Ont.

## Anvils

Alkenhead Hardware Ltd., Toronto, Ont.  
Atkins & Co., Inc., E. C., Indianapolis, I.  
Columbia Hdw. Division, Cleveland, O.  
Petrie, Ltd., H. W., Toronto, Ont.

## Arbors

Atkins & Co., Inc., E. C., Indianapolis, I.  
Brown & Sharpe Mfg. Co., Providence, R.I.  
Cleveland Twist Drill Co., Cleveland, O.  
Ford-Smith Machine Co., Hamilton, Ont.  
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.  
Jacobs Mfg. Co., Hartford, Conn.  
Kearney & Trecker Co., Milwaukee, Wis.  
Kempthorne Mfg. Co., Milwaukee, Wis.  
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.  
Skinner Chuck Co., New Britain, Conn.

## Axles, Car

Dom. Foundries & Steel, Hamilton, Ont.

## Babbitt Metal

Atkins & Co., Inc., E. C., Indianapolis, I.  
British Smelting & Refining Co., Ltd., Montreal, Que.  
Canada Metal Co., Ltd., Toronto, Ont.  
Fisher Motor Co., Ltd., Orillia, Ont.  
Hort Metal Co., Toronto, Ont.  
Magnolia Metal Co., Montreal, Que.  
Tallman Brass & Metal Co., Hamilton, Ont.

## Balls, Brass, Bronze and Steel

Canada Foundries & Forgings Co., Welland, Ont.  
Canadian SKF Co., Toronto, Ont.  
Dominion Foundries & Steel, Ltd., Hamilton, Ont.  
Pilot Steel & Tool Co., Montreal, Que.  
Railway Roller Bearing Co., Syracuse, N.Y.

## Bars, Tumbling

Baird Machine Co., Bridgeport, Conn.  
McDougall Co., Ltd., R., Galt, Ont.

## Bars, Boring

Armstrong Bros. Tool Co., Chicago, Ill.  
Bertram & Son Co., Ltd., The John, Dundas, Ont.  
Gisholt Machine Co., Madison, Wis.  
Madison Mfg. Co., Muskegon, Mich.

## Bars, Boring, Portable

Underwood Corp., H. B., Philadelphia, Pa.

## Bars, Bronze Cored

Moore & Son, Thos., Montreal, Que.  
Tallman Brass & Metal Co., Hamilton, Ont.

## Bars, Iron

Steel Co. of Canada, Ltd., Hamilton, Ont.

## Bars, Steel

Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.  
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.  
Canada Foundries & Forgings Co., Welland, Ont.  
Can. Steel Foundries, Montreal, Que.  
Dom. Foundries & Steel, Hamilton, Ont.

N. S. Steel Co., Ltd., New Glasgow, N.S.  
Pilot Steel & Tool Co., Montreal, Que.  
Steel Co. of Canada, Ltd., Hamilton, Ont.  
United Alloy Steel Corp., Canton, Ohio.  
Vanadium Alloys Steel, Latrobe, Pa.

## Bearings, Ball

Canadian SKF Co., Toronto, Ont.  
Chapman Double Ball Bearing Co., Toronto, Ont.  
Lang Mfg. Co., Guelph, Ont.  
Lyman Tube & Supply Co., Montreal, Que.  
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.  
Railway Roller Bearing Co., Syracuse, N.Y.

## Bearings, Bronze

Tallman Brass & Metal Co., Hamilton, Ont.  
Railway Roller Bearing Co., Syracuse, N.Y.

## Bearings, Die-Cast

Fisher Motor Co., Ltd., Orillia, Ont.  
Franklin Die-Casting Corp., Syracuse, N.Y.  
Tallman Brass & Metal Co., Hamilton, Ont.

## Bearings, Journal

Fisher Motor Co., Ltd., Orillia, Ont.  
Tallman Brass & Metal Co., Hamilton, Ont.

## Bearings, Roller

Lang Mfg. Co., Guelph, Ont.  
Lyman Tube & Supply Co., Montreal, Que.  
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.  
Pilot Steel & Tool Co., Montreal, Que.  
Railway Roller Bearing Co., Syracuse, N.Y.

## Belt Cement

Graton & Knight Mfg. Co., Worcester, Mass.  
McLaren Belting Co., J. C., Montreal, Que.

## Belt Clamps

Graton & Knight Mfg. Co., Worcester, Mass.

## Belt Dressings and Fillers

Alkenhead Hardware Ltd., Toronto, Ont.  
Dom. Belting Co., Ltd., Hamilton, Ont.  
Federal Eng'g Co., Ltd., Toronto, Ont.  
Graton & Knight Mfg. Co., Worcester, Mass.

## Belt Fasteners

Can. Consolidated Rubber Co., Ltd., Montreal, Que.  
Mich. Belt Lacer Co., Grand Rapids, Mich.  
Federal Eng'g Co., Ltd., Toronto, Ont.  
Graton & Knight Mfg. Co., Worcester, Mass.  
McLaren Belting Co., J. C., Montreal, Que.  
Rice Lewis & Son, Ltd., Toronto, Ont.

## Belt Lacing

Clinner Belt Lacer Co., Grand Rapids, Mich.  
Federal Eng'g Co., Ltd., Toronto, Ont.  
Graton & Knight Mfg. Co., Worcester, Mass.  
McLaren Belting Co., J. C., Montreal, Que.

## Belt Lacing, Steel

Flexible Steel Lacing Co., Chicago, Ill.

## Belt Lacing, Hinged

Flexible Steel Lacing Co., Chicago, Ill.

## Belt Lacing, Flexible Steel

Flexible Steel Lacing Co., Chicago, Ill.

## Belt Lacing Machines

Clinner Belt Lacer Co., Grand Rapids, Mich.  
Federal Eng'g Co., Ltd., Toronto, Ont.  
McLaren Belting Co., J. C., Montreal, Que.  
Petrie, Ltd., H. W., Toronto, Ont.

## Belt Joiners, Conveyor

Flexible Steel Lacing Co., Chicago, Ill.

## Belt Tools

Graton & Knight Mfg. Co., Worcester, Mass.

## Belting, Chain

Can. Link-Belt Co., Toronto, Ont.  
Jones & Glasco, Montreal, Que.  
Lyman Tube & Supply Co., Montreal, Que.  
Morse Chain Co. Utica N.Y.  
Renold (Hans) of Canada, Ltd., Montreal, Que.

## Belting, Fabric

Atkins & Co., Inc., E. C., Indianapolis, I.  
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

Dom. Belting Co., Ltd., Hamilton, Ont.

Federal Eng'g Co., Ltd., Toronto, Ont.

Foss Machinery & Supply Co., Geo. F., Montreal, Que.

McLaren Belting Co., J. C., Montreal, Que.

Summer & Co., New York City

## Belting, Leather

Atkins & Co., Inc., E. C., Indianapolis, I.  
Can. Fairbanks-Morse Ltd., Montreal, Q.  
Federal Eng'g Co., Ltd., Toronto, Ont.  
Graton & Knight Mfg. Co., Worcester, Mass.

McLaren Belting Co., J. C., Montreal, Que.

Smith Belting Co., Toronto, Ont.

Summer & Co., New York City

Tullis & Son, Ltd., John, Glasgow, Scot.

## Belting, Rubber

Can. Consolidated Rubber Co., Ltd., Montreal, Que.  
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.

Gutta Percha & Rubber, Toronto, Ont.

Quaker City Rubber Co., Philadelphia, Pa.

## Belts, Abrasive

Federal Eng'g Co., Ltd., Toronto, Ont.  
Oskey & Sons, Ltd., John London, S.E., Eng.

## Bench Countershaft Standards

Ford-Smith Machine Co., Hamilton, Ont.

## Benchs, Work

Alkenhead Hardware Ltd., Toronto, Ont.

## Bending Machines, Power

Bertram & Son Co., Ltd., The John, Dundas, Ont.  
Bertram & Son, Ltd., Edinburgh, Scotland.  
Brown, Boggs & Co., Ltd., Hamilton, Ont.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Williams Machinery Co., A. R., Toronto, Ont.

## Bins, Ore

MacKinnon Steel Co., Sherbrooke, Que.

## Blocks

Ford Chain Block Co., Philadelphia, Pa.  
Wright Mfg. Co., Lisbon, Ohio.

## Blocks, Chain (See Hoists, Hand)

Alkenhead Hardware Ltd., Toronto, Ont.  
Ford Chain Block Co., Philadelphia, Pa.  
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.  
Wright Mfg. Co., Lisbon, Ohio.

## Blocks, Die

Canada Foundries & Forgings Co., Welland, Ont.  
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.  
Dom. Foundries & Steel, Hamilton, Ont.  
Fisher Motor Co., Ltd., Orillia, Ont.  
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

## Blocks, Pillow

Can. Link-Belt Co., Toronto, Ont.

## Blowers

Can. Blower & Forge Co., Ltd., Kitchener.  
General Combustion Co. of Can., Ltd., Montreal, Que.  
Petrie, Ltd., H. W., Toronto, Ont.  
Sheffield Engineering Supplies, Ltd., Montreal, Que.  
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.  
Sturtevant Co., B. F., Boston, Mass.

## Bolt and Nut Machinery

Acme Machinery Co., Cleveland, Ohio.  
Bertram & Son Co., Ltd., The John, Dundas, Ont.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Greenfield Tap & Die Corp., Galt, Ont.  
Landis Machine Co., Inc., Waynesboro, Pa.  
National Machinery Co., Tiffin, Ohio.  
Victor Tool Co., Waynesboro, Pa.

## Bolt and Nut Machinery, Automatic

National Acme Co., Cleveland, Ohio.

## Bolts and Nuts

London Bolt & Hinge Works, London, Ont.  
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.  
National Acme Co., Cleveland, Ohio.  
N. S. Steel Co., Ltd., New Glasgow, N.S.  
Petrie, Ltd., H. W., Toronto, Ont.  
Steel Co. of Canada, Ltd., Hamilton, Ont.

## Bolt Threading Die Heads

Jones & Lamson Machine Co., Springfield, Vermont.  
Landis Machine Co., Inc., Waynesboro, Pa.

## Boosters

Sturtevant Co., B. F., Boston, Mass.

## Boring and Turning Mills, Vertical

Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.

Bertram & Son Co., Ltd., The John, Dundas, Ont.

Garlock-Walker Mch. Co., Toronto, Ont.

Gisholt Machine Co., Madison, Wis.

Herbert Ltd., Alfred, Toronto, Ont.

## Boring, Drilling and Milling Machines, Horizontal

Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.

Bertram & Son Co., Ltd., The John, Dundas, Ont.

Canada Machinery Corp., Galt, Ont.

Garlock-Walker Mch. Co., Toronto, Ont.

Gisholt Machine Co., Madison, Wis.

Herbert Ltd., Alfred, Toronto, Ont.

Landis Tool Co., Waynesboro, Pa.

## Boring, Drilling and Milling Mach., Vertical

Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.

Canada Machinery Corp., Galt, Ont.

Garlock-Walker Mch. Co., Toronto, Ont.

Herbert Ltd., Alfred, Toronto, Ont.

McDougall Co., Ltd., R., Galt, Ont.

Oliver Machinery Co., Grand Rapids, Mich.

Petrie, Ltd., H. W., Toronto, Ont.

## Boring Heads

Alkenhead Hardware Ltd., Toronto, Ont.

## Boring Tools

Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.

Armstrong Bros. Tool Co., Chicago, Ill.

Gisholt Machine Co., Madison, Wis.

## Brakes, Magnetic (for electric furnaces)

Volta Mfg. Co., Welland, Ont.

## Brass

Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.  
Ontario Metal Products Co., Ltd., Toronto, Ont.

## Bricks, Fire

Elk Firebrick Co. of Can., Ltd., Hamilton, Ont.

## Bridges

Hamilton Bridge Works Co., Ltd., Hamilton, Ont.  
MacKinnon Steel Co., Sherbrooke, Que.

## Broaching Machines

Bilton Machine Co., Bridgeport, Conn.  
Garlock-Walker Mch. Co., Toronto, Ont.

## Bronze

Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.  
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

## Bronze, Phosphor

British Smelting & Refining Co., Ltd., Montreal, Que.  
Canada Metal Co., Ltd., Toronto, Ont.

## Bucket Carriers, Pivoted

Can. Link-Belt Co., Toronto, Ont.

## Buffing or Polishing Machines (See Polishing and Buffing Machines)

Blount Co., J. G., Everett, Mass.  
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.  
Ford-Smith Machine Co., Hamilton, Ont.  
Petrie, Ltd., H. W., Toronto, Ont.  
U.S. Electrical Tool Co., Cincinnati, O.

## Bulldozers

Bertram & Son Co., Ltd., The John, Dundas, Ont.  
Canada Machinery Corp., Galt, Ont.  
Garlock-Walker Mch. Co., Toronto, Ont.

## Burners, Oil and Gas

General Combustion Co. of Can., Ltd., Montreal, Que.  
Rockwell Co., W. S., New York City

## Bushings

Fisher Motor Co., Ltd., Orillia, Ont.  
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

## Cabinets, Oil

S. F. Bowser & Co., Ltd., Toronto, Ont.

## Calipers

Brown & Sharpe Mfg. Co., Providence, R.I.  
Starrett Co., L. S., Athol, Mass.

## Cams

Canada Foundries & Forgings Co., Welland, Ont.

## Can-Making Machinery (See Sheet Metal Working Machinery)

Bliss Co., E. W., Brooklyn, N.Y.  
Brown, Boggs & Co., Ltd., Hamilton, Ont.  
MacKinnon Steel Co., Sherbrooke, Que.



# BUYERS' DIRECTORY

**Cars, Ore**  
MacKinnon Steel Co., Sherbrooke, Que.

**Castings, Aluminum**  
Canada Electric Castings Co., Ltd., Orillia  
Can. Hanson & Van Winkle Co., Toronto, Ont.  
Canada Metal Co., Ltd., Toronto, Ont.  
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Brass and Bronze**  
Algoma Steel Corp., Ltd., Sault Ste Marie, Ont.  
Canada Electric Castings Co., Ltd., Orillia  
Can. Hanson & Van Winkle Co., Toronto, Ont.  
Canada Metal Co., Ltd., Toronto, Ont.  
Can. Driver-Harris Co., Walkerville, Ont.  
Electric Steel & Engineering Co., Welland, Ont.  
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Copper**  
Can. Hanson & Van Winkle Co., Toronto, Ont.  
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Marine**  
Can. Steel Foundries, Montreal, Que.  
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Castings, Die Molded**  
Fisher Motor Co., Ltd., Orillia, Ont.  
Franklin Die-Casting Corp., Syracuse, N.Y.  
Katie Foundry Co., Galt, Ont.  
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Ferro-Alloy**  
Can. Steel Foundries, Montreal, Que.

**Castings, Iron**  
Algoma Steel Corp., Ltd., Sault Ste Marie, Ont.  
Bernard Industrial Co., A., Fortierville, Que.  
Bilton Machine Co., Bridgeport, Conn.  
Brown, Boggs & Co., Ltd., Hamilton, Ont.  
Can. Hanson & Van Winkle Co., Toronto, Ont.  
Canada Electric Castings Co., Ltd., Orillia  
Hanna & Co., M. A., Cleveland, Ohio  
Heppburn Ltd., John T., Toronto, Ont.  
Katie Foundry Co., Galt, Ont.  
Kennedy & Sons, Wm., Owen Sound, Ont.  
McDougall Co., Ltd., R., Galt, Ont.  
Victoria Foundry Co., Ltd., Ottawa, Ont.  
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Hyd. Press**  
Can. Steel Foundries, Montreal, Que.

**Castings, Monel Metal**  
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

**Castings, Naval Bronze**  
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Nichrome**  
Can. Driver-Harris Co., Walkerville, Ont.  
Electric Steel & Engineering Co., Welland, Ont.  
Hull Iron & Steel Foundries, Hull, Que.  
Katie Foundry Co., Galt, Ont.  
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Nickel**  
Can. Hanson & Van Winkle Co., Toronto, Ont.

**Castings, Semi-Steel**  
Davidson Mfg. Co., Thos., Montreal, Que.  
Hull Iron & Steel Foundries, Hull, Que.  
Katie Foundry Co., Galt, Ont.  
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

**Castings, Steel**  
Dominion Foundries & Steel, Ltd., Hamilton, Ont.  
Can. Steel Foundries, Montreal, Que.  
Kennedy & Sons, Wm., Owen Sound, Ont.  
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

**Cements, Iron**  
Smooth Mfg. Co., Jersey City, N.J.

**Centering Machines**  
Bertram & Son Co., Ltd., The John Dundas, Ont.  
Garlock-Walker Mch. Co., Toronto, Ont.

**Chains (See Sprockets and Chains)**  
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.  
Morse Chain Co., Ithaca, N.Y.  
Philadelphia Gear Works, Philadelphia, Pa.  
Renold (Hans) of Canada, Ltd., Montreal, Que.  
Wright Mfg. Co., Lisbon, Ohio

**Chains, Driving**  
Can. Link-Belt Co., Toronto, Ont.  
Greenfield Tap & Die Corp., Galt, Ont.  
Jones & Glasco, Montreal, Que.  
Morse Chain Co., Ithaca, N.Y.  
Renold (Hans) of Canada, Ltd., Montreal, Que.  
Wright Mfg. Co., Lisbon, Ohio

**Chasers**  
Bertram & Son Co., Ltd., The John Dundas, Ont.  
Jones & Lamson Machine Co., Springfield, Vt.  
Landis Machine Co., Inc., Waynesboro, Pa.  
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chemists**  
Toronto Testing Laboratory, Toronto, Ont.

## Chucking Machines

Acme Machine Tool Co., Cincinnati, Ohio  
Brown & Sharpe Mfg. Co., Providence, R.I.  
Gisholt Machine Co., Madison, Wis.  
Jones & Lamson Machine Co., Springfield, Vermont.  
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.  
Steinle Turret Machine Co., Madison, Wis.  
Warner & Swasey Co., Cleveland, Ohio.

**Chucks, Drill**  
Jacobs Mfg. Co., Hartford, Conn.

**Chucks, Drill and Tap**  
Aikenhead Hardware Ltd., Toronto, Ont.  
Canadian SKF Co., Toronto, Ont.  
Cushman Chuck Co., Hartford, Conn.  
Dom. Steel Products Co., Brantford, Ont.  
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.  
Morse Twist Drill & Machine Co., New Bedford, Mass.  
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.  
Skinner Chuck Co., New Britain, Conn.  
Union Mfg. Co., New Britain, Conn.  
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Lathe**  
Aikenhead Hardware Ltd., Toronto, Ont.  
Bertram & Son Co., Ltd., The John Dundas, Ont.  
Cushman Chuck Co., Hartford, Conn.  
Dom. Steel Products Co., Brantford, Ont.  
Foss Machinery & Supply Co., Geo. F., Montreal, Que.  
Geometric Tool Co., New Haven, Conn.  
Gisholt Machine Co., Madison, Wis.  
Ker & Goodwin Machine Co., Brantford, Ont.  
Petrie, Ltd., H. W., Toronto, Ont.  
Skinner Chuck Co., New Britain, Conn.  
Union Mfg. Co., New Britain, Conn.  
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Magnetic**  
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chucks, Planer**  
Bertram & Son Co., Ltd., The John Dundas, Ont.  
Cushman Chuck Co., Hartford, Conn.  
Skinner Chuck Co., New Britain, Conn.  
Union Mfg. Co., New Britain, Conn.

**Chucks, Vertical Boring Mill**  
Bertram & Son Co., Ltd., The John Dundas, Ont.  
Gisholt Machine Co., Madison, Wis.  
Skinner Chuck Co., New Britain, Conn.  
Union Mfg. Co., New Britain, Conn.

**Clamps, Machinists'**  
Columbia Valve Division, Cleveland, O.  
Dickow, Fred C., Chicago, Ill.  
Starrett Co., L. S., Athol, Mass.

**Cleaners, Metal, Waste, General**  
Oakley Chemical Co., New York, N.Y.

**Clocks, Time**  
Gisholt Machine Co., Madison, Wis.  
International Business Machines Co., Toronto, Ont.

**Clutches, Friction**  
Bernard Industrial Co., A., Fortierville, Que.

Can. Link-Belt Co., Toronto, Ont.  
Ford-Smith Machine Co., Hamilton, Ont.  
Johnson Machine Co., Carlyle, Manchester, Conn.  
Positive Clutch & Pulley Works, Toronto, Ont.

**Coal and Ash Handling Machinery**  
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Can. Link-Belt Co., Toronto, Ont.  
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Coal-Storage Systems**  
Can. Link-Belt Co., Toronto, Ont.

**Collars, Shaft or Set**  
Canada Foundries & Forgings Co., Welland, Ont.  
Can. Link-Belt Co., Toronto, Ont.

**Collets**  
Ackworth Ltd., John, Birmingham, Eng.  
Butterfield & Co., Inc., Rock Island, Que.  
Canada Machinery Corp., Galt, Ont.  
Hendey Machine Co., Torrington, Conn.  
Kearney & Trecker Co., Milwaukee, Wis.  
Petrie, Ltd., H. W., Toronto, Ont.  
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Compounds, Carburizing, Case Hardening and Tempering**  
Cataract Refining Co., Toronto, Ont.

**Compounds, Cleaning**  
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.  
Oakley Chemical Co., New York, N.Y.

**Compounds, Cutting, Drilling, Grinding, Screw Cutting**  
Atkins & Co., Inc., E. C., Indianapolis, I.  
Cataract Refining Co., Toronto, Ont.  
Oakley Chemical Co., New York, N.Y.

**Compressors, Air**  
Curtis Pneumatic Machinery Co., St. Louis, Mo.

**Compressors, Air and Gas**  
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.  
Garlock-Walker Mch. Co., Toronto, Ont.

Holden Co., Ltd., Montreal, Que.  
Petrie, Ltd., H. W., Toronto, Ont.

**Cones, Friction**  
Norton Co. of Can., Ltd., Hamilton, Ont.

**Connecting Rods and Straps**  
Canada Foundries & Forgings Co., Welland, Ont.

**Contract Work**  
Ford-Smith Machine Co., Hamilton, Ont.  
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.  
Victoria Foundry Co., Ltd., Ottawa, Ont.

**Conveyors and Elevators (See Elevators)**  
Jones & Glasco, Montreal, Que.  
Main Belting Co. of Can., Montreal, Que.  
Mathews Gravity Carrier Co., Port Hope, Ont.

**Conveyor Belt Joiners**  
Flexible Steel Lacing Co., Chicago, Ill.

**Copper**  
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Cored Bronze Bars**  
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Cotter Pins**  
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Counterbores**  
Cleveland Twist Drill Co., Cleveland, O.  
Eclipse Counterbore Co., Ltd., Walkerville, Ont.  
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.  
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Counters, Revolution**  
Aikenhead Hardware Ltd., Toronto, Ont.  
Starrett Co., L. S., Athol, Mass.

**Countershafts**  
Bertram & Son Co., Ltd., The John Dundas, Ont.  
Canada Foundries & Forgings Co., Welland, Ont.  
Ford-Smith Machine Co., Hamilton, Ont.  
Johnson Machine Co., Carlyle, Manchester, Conn.  
Kensmith Mfg. Co., Milwaukee, Wis.  
McDougall Co., Ltd., R., Galt, Ont.

**Countersinks**  
Butterfield & Co., Inc., Rock Island, Que.  
Eclipse Counterbore Co., Ltd., Walkerville, Ont.  
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Couplers, Car and Locomotive**  
Can. Steel Foundries, Montreal, Que.

**Couplings, Flexible**  
Holden Co., Ltd., Montreal, Que.

**Couplings, Rigid**  
Bernard Industrial Co., A., Fortierville, Que.

**Couplings, Shaft**  
Bilton Machine Co., Bridgeport, Conn.  
Can. Link-Belt Co., Toronto, Ont.

**Cranes, Electric**  
Bertram & Son Co., Ltd., The John Dundas, Ont.  
Can. Link-Belt Co., Toronto, Ont.  
Dominion Bridge Co., Ltd., Lachine, Que.  
Heppburn Ltd., John T., Toronto, Ont.  
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Northern Crane Works, Walkerville, Ont.  
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.

**Cranes, Hand (See Hoists, Hand)**  
Dominion Bridge Co., Ltd., Lachine, Que.  
Heppburn Ltd., John T., Toronto, Ont.  
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.  
Northern Crane Works, Walkerville, Ont.  
Sheffield Engineering Supplies, Ltd., Montreal, Que.

**Cranes, Locomotive**  
Can. Link-Belt Co., Toronto, Ont.  
Holden Co., Ltd., Montreal, Que.

**Cranes, Traveling**  
Bertram & Son Co., Ltd., The John Dundas, Ont.  
Can. Link-Belt Co., Toronto, Ont.  
Dominion Bridge Co., Ltd., Lachine, Que.  
Heppburn Ltd., John T., Toronto, Ont.  
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.  
Northern Crane Works, Walkerville, Ont.

**Crank Pin Turning Machines**  
Garlock-Walker Mch. Co., Toronto, Ont.  
Herbert Ltd., Alfred, Toronto, Ont.  
Underwood Corp., H. B., Philadelphia, Pa.

**Cutters, Flue**  
Holden Co., Ltd., Montreal, Que.

**Cutters, Gear**  
Armstrong-Whitworth Co. of Can., Ltd., Montreal, Que.  
Brown & Sharpe Mfg. Co., Providence, R.I.  
Butterfield & Co., Inc., Rock Island, Que.  
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, High Speed**  
Armstrong-Whitworth Co. of Can., Ltd., Montreal, Canada  
Atkins & Co., Inc., E. C., Indianapolis, I.

Bilton Machine Co., Bridgeport, Conn.  
Butterfield & Co., Inc., Rock Island, Que.  
Eclipse Counterbore Co., Ltd., Walkerville, Ont.  
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.  
Kearney & Trecker Co., Milwaukee, Wis.  
Madison Mfg. Co., Muskegon, Mich.  
Pilot Steel & Tool Co., Montreal, Que.  
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Milling**  
Armstrong-Whitworth Co. of Can., Ltd., Montreal, Canada.  
Bilton Machine Co., Bridgeport, Conn.  
Brown & Sharpe Mfg. Co., Providence, R.I.  
Butterfield & Co., Inc., Rock Island, Que.  
Cleveland Milling Machine Co., Cleveland, Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.  
Kearney & Trecker Co., Milwaukee, Wis.  
Morsey Twist Drill & Machine Co., New Bedford, Mass.  
Pilot Steel & Tool Co., Montreal, Que.

**Cutters, Stay Bolt**  
Acme Machinery Co., Cleveland, Ohio.  
Landis Machine Co., Inc., Waynesboro, Pa.  
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Thread**  
Butterfield & Co., Inc., Rock Island, Que.  
Greenfield Tap & Die Corp., Galt, Ont.  
Jones & Lamson Machine Co., Springfield, Vt.  
Landis Machine Co., Inc., Waynesboro, Pa.

**Cutting-Off Machines**  
Bertram & Son Co., Ltd., The John Dundas, Ont.  
Brown & Sharpe Mfg. Co., Providence, R.I.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Greenfield Tap & Die Corp., Galt, Ont.  
Petrie, Ltd., H. W., Toronto, Ont.  
Starrett Co., L. S., Athol, Mass.

**Cutting-Off Machines (See Pipe Cutting and Threading Machines)**  
Landis Machine Co., Inc., Waynesboro, Pa.  
McDougall Co., Ltd., R., Galt, Ont.  
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Cutting-Off Tools**  
Armstrong-Whitworth Co. of Canada, Ltd., Montreal, Canada.  
Armstrong Bros. Tool Co., Chicago, Ill.  
Pilot Steel & Tool Co., Montreal, Que.

**Cutting Oil Filters (See Oil Filtering Systems)**  
Brewer, S. F. & Co., Ltd., Toronto, Can.  
Cataract Refining Co., Toronto, Ont.

**Cutting, Oxy-Acetylene**  
Carter Welding Co., Toronto, Ont.  
Horten Co., Ltd., Montreal, Que.  
Perdue, W. B., San Francisco, Calif.  
Prest-O-Lite Co. of Can., Toronto, Ont.  
Turner Brass Works, Sycamore, Ill.  
Union Carbide Co. of Can., Welland, Ont.

**Cutting, Oxy-Hydrogen**  
National Electro Products, Ltd., Toronto, Ont.

**Dealers, Machinery (See Searchlight Section)**  
Ford-Smith Machine Co., Hamilton, Ont.  
Petrie, Ltd., H. W., Toronto, Ont.

**Deckle Straps**  
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Diamonds, Black and Rough**  
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond, Carbon and Bort**  
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond Tools**  
Aikenhead Hardware Ltd., Toronto, Ont.  
Can. Desmond-Stephan Co., Hamilton, Ont.

Ford-Smith Machine Co., Hamilton, Ont.  
Wheel Trueing Tool Co., Detroit, Mich.

**Diamond Crossings**  
Can. Steel Foundries, Montreal, Que.

**Die-Castings**  
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Dies, Pipe-Threading**  
Jones & Lamson Machine Co., Springfield, Vt.

**Die Sinking Machines, Automatic**  
Jones & Lamson Machine Co., Springfield, Vt.  
Walcott Lathe Co., Jackson, Mich.

**Die Sinkers**  
Kimber & Hillier, St. Catharines, Ont.

**Dies, Screw and Thread Cutting**  
Ackworth Ltd., John, Birmingham, Eng.  
Butterfield & Co., Inc., Rock Island, Que.  
Greenfield Tap & Die Corp., Galt, Ont.  
Jardine & Co. A. B., Hesper, Ont.  
Jones & Lamson Machine Co., Springfield, Vt.  
Landis Machine Co., Inc., Waynesboro, Pa.  
Munley Machine & Tool Co., Detroit, Mich.  
National Acme Co., Cleveland, Ohio.

**Dies, Sheet-Metal and Sub-Press (See Tool Work)**  
Armstrong-Whitworth Co. of Canada, Ltd., Montreal, Canada.  
Brown, Boggs & Co., Ltd., Hamilton, Ont.  
Fisher Motor Co., Ltd., Orillia, Ont.  
Ford-Smith Machine Co., Hamilton, Ont.  
Toledo Machine & Tool Co., Toledo, Ohio.



# BUYERS' DIRECTORY

## Dies, Forging

Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.  
Brown, Boggs & Co., Ltd., Hamilton, Ont.  
Canada Foundries & Forgings Co., Welland, Ont.  
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.  
Kimber & Hillier Mfg. Co., St. Catharines, Ont.

## Dies, Hammer

Kimber & Hillier, St. Catharines, Ont.

## Dies, Self-Opening, Adjustable

Geometric Tool Co., New Haven, Conn.  
Herbert Ltd., Alfred, Toronto, Ont.  
Jones & Lamson Machine Co., Springfield, Vt.  
Landis Machine Co., Inc., Waynesboro, Pa.  
Murchey Machine & Tool Co., Detroit, Mich.  
National Acme Co., Cleveland, Ohio.  
Prest-O-Lite Co. of Can., Toronto, Ont.  
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.  
Victor Tool Co., Waynesboro, Pa.

## Dies, Threading-Opening

Jardine & Co., A. B., Hespeler, Ont.  
Jones & Lamson Machine Co., Springfield, Vt.  
Landis Machine Co., Inc., Waynesboro, Pa.  
Morse Twist Drill & Machine Co., New Bedford, Mass.  
Murchey Machine & Tool Co., Detroit, Mich.  
National Acme Co., Cleveland, Ohio.  
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.  
Rapid Tool & Machine Co., Lachine, Que.

## Disc Cement

Ritchey Supply Co., Toronto, Ont.  
Wausau Abrasives Co., Chicago, Ill.

## Dividing Heads

Ackworth, Ltd., John, Birmingham, Eng.  
Dickson, Fred. C., Machinery Co., Chicago, Ill.  
Ford-Smith Machine Co., Hamilton, Ont.  
Hendey Machine Co., Torrington, Conn.  
Kearney & Trecker Co., Milwaukee, Wis.  
Petrie, Ltd., H. W., Toronto, Ont.

## Dogs, Lathe and Milling Machine

Armstrong Bros. Tool Co., Chicago, Ill.

## Drafting Boards and Tables

Darling Bros., Ltd., Montreal, Que.  
Economy Drawing Table & Mfg. Co., Adrian, Mich.  
Hughes Owens Co., Ltd., Montreal, Que.

## Drafting Materials

American Lead Pencil Co., New York City, N.Y.  
Darling Bros., Ltd., Montreal, Que.  
Economy Drawing Table & Mfg. Co., Adrian, Mich.  
Hughes Owens Co., Ltd., Montreal, Que.

## Dressers, Grinding Wheel

Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.  
Ford-Smith Machine Co., Hamilton, Ont.  
Joyce-Koebel Co., Inc., New York, N.Y.  
Norton Co. of Can., Ltd., Hamilton, Ont.  
Oliver Machy. Co., Grand Rapids, Mich.

## Drill Holders

Armstrong Bros. Tool Co., Chicago, Ill.

## Drill Rods

Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.  
Alkenhead Hardware Ltd., Toronto, Ont.  
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

## Drill Speeders

Canada Machinery Corp., Galt, Ont.

## Drilling Machine Heads

Henry & Wright Mfg. Co., Hartford, Conn.  
Hoefler Mfg. Co., Freeport, Ill.  
United States Machine Tool Co., Cincinnati, Ohio.

## Drilling Machines, Automatic

Hoosier Drilling Mach. Co., Goshen, Ind.  
National Automatic Tool Co., Richmond, Ind.

## Drilling Machines, Bench

Beacon Engineering Co., Tipton, England.  
Can. Blower & Forge Co., Ltd., Kitchener.  
Henry & Wright Mfg. Co., Hartford, Conn.  
Petrie, Ltd., H. W., Toronto, Ont.  
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.  
Terry & Co., John C., Birmingham, Eng.  
U.S. Electrical Tool Co., Cincinnati, O.  
Wisconsin Electric Co., Racine, Wis.

## Drilling Machines, Electric and Hand

Alkenhead Hardware Ltd., Toronto, Ont.  
Cincinnati Electrical Tool Co., Cincinnati, Ohio.  
Foss Machinery & Supply Co., Geo. F., Montreal, Que.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Holden Co., Ltd., Montreal, Que.  
Independent Pneumatic Tool, Chicago, Ill.  
Jardine & Co., A. B., Hespeler, Ont.  
Wisconsin Electric Co., Racine, Wis.

## Drilling Machines, Gang

Bertram & Son Co., Ltd., The John Dundas, Ont.  
Bilton Machine Co., Bridgeport, Conn.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Hoefler Mfg. Co., Freeport, Ill.  
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

## Drilling Machines, Heavy Duty

Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.  
Bertram & Son Co., Ltd., The John Dundas, Ont.

Canada Machinery Corp., Galt, Ont.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Hoosier Drilling Mach. Co., Goshen, Ind.  
Rockford Lathe & Drill Co., Rockford, Ill.

## Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)

Canada Machinery Corp., Galt, Ont.  
Gisholt Machine Co., Madison, Wis.  
Holly, R. S., Toronto, Ont.  
Rockford Drilling Machine Co., Rockford, Ill.  
Rockford Lathe & Drill Co., Rockford, Ill.

## Drilling Machines, Multiple Spindle

Beacon Engineering Co., Tipton, England.  
Bertram & Son Co., Ltd., The John Dundas, Ont.  
Bilton Machine Co., Bridgeport, Conn.  
Henry & Wright Mfg. Co., Hartford, Conn.  
Hoefler Mfg. Co., Freeport, Ill.  
National Acme Co., Cleveland, Ohio.  
National Automatic Tool Co., Richmond, Ind.  
Terry & Co., John C., Birmingham, Eng.

## Drilling Machines, Pneumatic

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.  
Cleveland Pneumatic Tool Co., Toronto, Ont.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Holden Co., Ltd., Montreal, Que.  
Independent Pneumatic Tool, Chicago, Ill.

## Drilling Machines, Portable

Holden Co., Ltd., Montreal, Que.  
Independent Pneumatic Tool, Chicago, Ill.  
Jardine & Co., A. B., Hespeler, Ont.  
Wisconsin Electric Co., Racine, Wis.

## Drilling Machines, Radial

Bertram & Son Co., Ltd., The John Dundas, Ont.  
Canada Machinery Corp., Galt, Ont.  
Foss Machinery & Supply Co., Geo. F., Montreal, Que.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Henry & Wright Mfg. Co., Hartford, Conn.  
Herbert Ltd., Alfred, Toronto, Ont.  
Petrie, Ltd., H. W., Toronto, Ont.  
Williams Machinery Co., A. R., Toronto, Ont.  
Williams Machinery & Supply Co., A. R., Montreal, Que.

## Drilling Machines, Sensitive

Beacon Engineering Co., Tipton, England.  
Bilton Machine Co., Bridgeport, Conn.  
Henry & Wright Mfg. Co., Hartford, Conn.  
Herbert Ltd., Alfred, Toronto, Ont.  
Hoosier Drilling Mach. Co., Goshen, Ind.  
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.  
Rockford Drilling Machine Co., Rockford, Ill.  
Terry & Co., John C., Birmingham, Eng.  
United States Machine Tool Co., Cincinnati, Ohio.  
Williams Machinery Co., A. R., Toronto, Ont.  
Wisconsin Electric Co., Racine, Wis.

## Drilling Machines, Turret

Gisholt Machine Co., Madison, Wis.  
Steinle Turret Machine Co., Madison, Wis.  
Williams Machinery Co., A. R., Toronto, Ont.

## Drilling Machines, Vertical

Aurora Tool Works, Aurora, Ind.  
Bertram & Son Co., Ltd., The John Dundas, Ont.  
Canada Machinery Corp., Galt, Ont.  
Can. Blower & Forge Co., Ltd., Kitchener.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Herbert Ltd., Alfred, Toronto, Ont.  
Hoefler Mfg. Co., Freeport, Ill.  
Hoosier Drilling Mach. Co., Goshen, Ind.  
McDougall Co., Ltd., R. Galt, Ont.  
Petrie, Ltd., H. W., Toronto, Ont.  
Rockford Drilling Machine Co., Rockford, Ill.  
Rockford Lathe & Drill Co., Rockford, Ill.  
Perfect Machine Co., Ltd., Galt, Ont.  
Terry & Co., John C., Birmingham, Eng.  
Stoutinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

## Drills, Center

Butterfield & Co., Inc., Rock Island, Que.  
Cleveland Twist Drill Co., Cleveland, O.  
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.  
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.  
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

## Drills, High Speed Twist

Armstrong-Whitworth Co. of Can., Ltd., Montreal, Que.  
Butterfield & Co., Inc., Rock Island, Que.  
Cleveland Twist Drill Co., Cleveland, O.  
Can. Detroit Twist Drill Co., Walkerville, Ont.  
Foss Machinery & Supply Co., Geo. F., Montreal, Que.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.  
Lyman Tube & Supply Co., Montreal, Que.  
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Morse Twist Drill & Machine Co., New Bedford, Mass.

Pilot Steel & Tool Co., Montreal, Que.  
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.  
Sheffield Engineering Supplies, Ltd., Montreal, Que.  
Sheffield Twist Drill & Steel Co., Sheffield, Eng.

## Drills, Ratchet

Armstrong Bros. Tool Co., Chicago, Ill.  
Butterfield & Co., Inc., Rock Island, Que.  
Cleveland Twist Drill Co., Cleveland, O.  
Cleveland Twist Drill Co., Cleveland, O.  
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.  
Morse Twist Drill & Machine Co., New Bedford, Mass.

## Drills, Twist and Flat

Butterfield & Co., Inc., Rock Island, Que.  
Cleveland Twist Drill Co., Cleveland, O.  
Can. Detroit Twist Drill Co., Walkerville, Ont.  
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.  
Pilot Steel & Tool Co., Montreal, Que.

## Dust Handling Equipment

Can. Blower & Forge Co., Ltd., Kitchener.  
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.  
Sturtevant Co., B. F., Boston, Mass.

## Electrical Instruments

Bristol Co., Waterbury, Conn.  
Northern Electric Co., Montreal, Que.

## Electrical Supplies

Atkins & Co., Inc., E. C., Indianapolis, I.  
Diamond State Fibre Co., Toronto, Ont.  
Northern Electric Co., Montreal, Que.  
U.S. Electrical Tool Co., Cincinnati, O.

## Elevating Trucks (See Trucks)

Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

## Elevators and Conveyors

Can. Link-Belt Co., Toronto, Ont.  
Jones & Glasco, Montreal, Que.  
Lyman Tube & Supply Co., Montreal, Que.  
Main Belting Co. of Can., Montreal, Que.  
Mathews Gravity Carrier Co., Port Hope, Ont.

## Emery Wheels (See Grinding Wheels)

Alkenhead Hardware Ltd., Toronto, Ont.  
Atkins & Co., Inc., E. C., Indianapolis, I.  
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.  
Ford-Smith Machine Co., Hamilton, Ont.  
Norton Co. of Can., Ltd., Hamilton, Ont.  
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

## Engines, Capstan

Kennedy & Sons, Wm., Owen Sound, Ont.

## Engines, Mechanical

Ford-Smith Machine Co., Hamilton, Ont.  
Gisholt Machine Co., Madison, Wis.  
Hamilton Gear & Machine Co., Toronto, Ont.  
Perdue, W. B., San Francisco, Calif.

## Expanders, Tube

Garlock-Walker Mch. Co., Toronto, Ont.  
Holden Co., Ltd., Montreal, Que.  
Jardine & Co., A. B., Hespeler, Ont.  
Petrie, Ltd., H. W., Toronto, Ont.

## Eyeglasses, Safety (See Goggles, Safety)

Prest-O-Lite Co. of Can., Toronto, Ont.  
Willson Goggles, Inc., Reading, Pa.

## Fans, Electric

Can. Blower & Forge Co., Ltd., Kitchener.  
Northern Electric Co., Montreal, Que.  
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.  
Sturtevant Co., B. F., Boston, Mass.

## Fans, Exhaust

Can. Blower & Forge Co., Ltd., Kitchener.  
Petrie, Ltd., H. W., Toronto, Ont.  
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.  
Sturtevant Co., B. F., Boston, Mass.

## Fans, Ventilating

Can. Blower & Forge Co., Ltd., Kitchener.  
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.  
Petrie, Ltd., H. W., Toronto, Ont.  
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.  
Sturtevant Co., B. F., Boston, Mass.

## Fibre

Diamond State Fibre Co., Toronto, Ont.  
Northern Electric Co., Montreal, Que.

## File Handles

Ingersoll File Co., Ltd., Ingersoll, Ont.

## Files and Rasps

Atkins & Co., Inc., E. C., Indianapolis, I.  
Foss Machinery & Supply Co., Geo. F., Montreal, Que.  
Ingersoll File Co., Ltd., Ingersoll, Ont.  
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.  
Nicholson File Co., Port Hope, Ont.  
Simonds Canada Saw Co., Montreal, Que.

## Filing Machines

Garlock-Walker Mch. Co., Toronto, Ont.  
Hoosier Machinery Co., Grand Rapids, Mich.  
Williams Machinery & Supply Co., A. R., Montreal, Que.

## Filler, Iron (See Cements, Iron)

Smooth Mfg. Co., Jersey City, N.J.

## Fire Extinguishers

Can. Consolidated Rubber Co., Ltd., Montreal, Que.

## Fittings, Pipe

International Malleable Iron Co., Guelph, Ont.

## Flexible Shafts

Alkenhead Hardware Ltd., Toronto, Ont.

## Flux, Galvanizing

British Smelting & Refining Co., Ltd., Montreal, Que.

## Fluxes, Welding

L'Air Liquide Society, Toronto, Ont.

## Forging Machinery

Acme Machinery Co., Cleveland, Ohio.  
Bertram & Son Co., Ltd., The John Dundas, Ont.  
Brown, Boggs & Co., Ltd., Hamilton, Ont.  
Canada Machinery Corp., Galt, Ont.  
Garlock-Walker Mch. Co., Toronto, Ont.  
National Machinery Co., Timm, Ohio.  
Stewart & Co., Duncan, Glasgow, Scot.

## Forgings, Drop

Canada Foundries & Forgings Co., W. land, Ont.  
Dominion Forge & Stamping Co., Lt Toronto, Ont.

## Forgings, Hammer

Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.  
Canada Foundries & Forgings Co., W. land, Ont.  
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.  
Dominion Bridge Co., Ltd., Lachine, Que.  
Dom. Foundries & Steel, Hamilton, Ont.  
Hepburn Ltd., John T., Toronto, Ont.  
N. S. Steel Co., Ltd., New Glasgow, N.S.  
Steel Co. of Canada, Ltd., Hamilton, Ont.

## Foundry Equipment

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.  
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.  
Ford-Smith Machine Co., Hamilton, Ont.  
Holden Co., Ltd., Montreal, Que.  
McDougall Co., Ltd., R. Galt, Ont.  
Petrie, Ltd., H. W., Toronto, Ont.  
Rice Lewis & Son, Ltd., Toronto, Ont.

## Foundry Supplies

Atkins & Co., Inc., E. C., Indianapolis, I.  
Rice Lewis & Son, Ltd., Toronto, Ont.  
Sturtevant Co., B. F., Boston, Mass.

## Frogs, Spring or Rigid

Can. Steel Foundries, Montreal, Que.

## Fuel Oil Burning System

General Combustion Co. of Can., Ltd., Montreal, Que.

## Furnaces, Electric

Electric Furnace Construction Co., Philadelphia, Pa.  
General Combustion Co. of Can., Ltd., Montreal, Que.

## Furnaces, Heat Treating Coal

General Combustion Co. of Can., Ltd., Montreal, Que.  
Mechanical Engineering Co., Three Rivers, Que.  
Rockwell Co., W. S., New York City.

## Furnaces, Heat Treating Oil and Gas

Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.  
Bellevue Industrial Furnace Co., Detroit.  
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

## General Combustion Co. of Can., Ltd.

Montreal, Que.  
Mechanical Engineering Co., Three Rivers, Que.  
Rockwell Co., W. S., New York City.  
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

## Furnaces and Ovens, Electric

Electric Furnace Construction Co., Philadelphia, Pa.  
Petrie, Ltd., H. W., Toronto, Ont.  
Volta Mfg. Co., Welland, Ont.  
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

## Furnaces, Tempering and Annealing

Brown & Sharpe Mfg. Co., Providence, R.I.  
Electric Furnace Construction Co., Philadelphia, Pa.  
Mechanical Engineering Co., Three Rivers, Que.  
Rockwell Co., W. S., New York City.  
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

## Furniture, Machine Shop

Garlock-Walker Mch. Co., Toronto, Ont.

## Gages, Comparator

Jones & Lamson Machine Co., Springfield, Vt.  
Herbert Ltd., Alfred, Toronto, Ont.  
Johansson Inc., C. E., Windsor, Ont.  
Perdue, W. B., San Francisco, Calif.  
Starrett Co., L. S., Athol, Mass.

## Gages, Measuring (See Tool Work)

Chesterman & Co., Ltd., J., Sheffield, Eng.  
Crescent Machine Co., Ltd., Montreal, Q.  
Greenfield Tap & Die Corp., Galt, Ont.  
Johansson Inc., C. E., Windsor, Ont.  
Starrett Co., L. S., Athol, Mass.

## Gages, Recording

Bristol Co., Waterbury, Conn.  
Johansson Inc., C. E., Windsor, Ont.



# BUYERS' DIRECTORY

**Gages, Snap, Thread and Cylindrical**  
Ackworth Ltd., John, Birmingham, Eng.  
Brown & Sharpe Mfg. Co., Providence, R.I.  
Greenfield Tap & Die Corp., Galt, Ont.  
Johansson Inc., C. E., Windsor, Ont.  
Pratt & Whitney Co., of Canada, Ltd.,  
Dundas, Ont.

**Gages, Special Measuring (See Tool Work)**  
Greenfield Tap & Die Corp., Galt, Ont.  
Pratt & Whitney Co., of Canada, Ltd.,  
Dundas, Ont.

**Gages, Standard**  
Armstrong Whitworth Co. of Can., Lt.  
Montreal, Que.  
Atkins & Co., Inc., E. C., Indianapolis.  
Johansson Inc., C. E., Windsor, Ont.

**Gages, Thread**  
Ackworth Ltd., John, Birmingham, Eng.  
Greenfield Tap & Die Corp., Galt, Ont.  
Johansson Inc., C. E., Windsor, Ont.  
Starrett Co., L. S., Athol, Mass.

**Garnet, Emery and Flint Paper and Cloth**  
Ritchey Supply Co., Toronto, Ont.

**Gas, Coal Compressed**  
L'Air Liquide Society, Toronto, Ont.

**Gas, Compressed**  
Prest-O-Lite Co. of Can., Toronto, Ont.

**Gaskets**  
Diamond State Fibre Co. of Can., Ltd.,  
Toronto, Ont.  
Dunlop Tire & Rubber Goods Co., Ltd.,  
Toronto, Ont.  
Goodyear Tire & Rubber Co. of Can.,  
Ltd., Toronto, Ont.  
Stolten Co., Ltd., Montreal, Que.  
Smooth Mfg. Co., Jersey City, N.J.

**Gear Blanks**  
Canada Foundries & Forgings Co., Wel-  
land, Ont.  
Can. Steel Foundries, Montreal, Que.  
Diamond State Fibre Co. of Can., Ltd.,  
Toronto, Ont.  
Dom. Foundries & Steel, Hamilton, Ont.  
Hamilton Gear & Machine Co., Toronto,  
Ontario.  
Philadelphia Gear Works, Philadelphia,  
Pa.

**Gear-Cutting Machines**  
Bertram & Son Co., Ltd., The John,  
Dundas, Ont.  
Filton Machine Co., Bridgeport, Conn.  
Brown & Sharpe Mfg. Co., Providence, R.I.  
Fellows Gear Shaper Co., Springfield, Vt.  
Petrie, Ltd., H. W., Toronto, Ont.  
Whitton Machine Co., D. E., New London,  
Conn.

**Gear Testing Machines**  
Brown & Sharpe Mfg. Co., Providence, R.I.

**Gears, Cast**  
Can. Link-Belt Co., Toronto, Ont.  
Can. Steel Foundries, Montreal, Que.  
Dom. Foundries & Steel, Hamilton, Ont.  
Fisher Motor Co., Ltd., Orillia, Ont.  
Hull Iron & Steel Foundries, Hull, Que.

**Gears, Cut**  
Brown & Sharpe Mfg. Co., Providence, R.I.  
Canadian SKF Co., Toronto, Ont.  
Crescent Machine Co., Ltd., Montreal, Q.  
Diamond State Fibre Co., Toronto, Ont.  
Dominion Bridge Co., Ltd., Lachine, Que.  
Dom. Steel Products Co., Brantford, Ont.  
Ford-Smith Machine Co., Hamilton, Ont.  
Gardner & Son, Robt., Montreal, Que.  
Hamilton Gear & Machine Co., Toronto,  
Ontario.  
Heppburn Ltd., John T., Toronto, Ont.  
Jardine & Co., A. B., Hespeler, Ont.  
Jones & Glasco, Montreal, Que.  
Lyman Tube & Supply Co., Montreal, Que.  
McDougall Co., Ltd., R. Galt, Ont.  
Philadelphia Gear Works, Philadelphia,  
Pa.  
Renold (Hans) of Canada, Ltd., Mont-  
real, Que.

**Gears, Dressed**  
Kennedy & Sons, Wm., Owen Sound, Ont.

**Gears, Forged**  
Canada Foundries & Forgings Co., Wel-  
land, Ont.  
Lyman Tube & Supply Co., Montreal, Que.

**Gears, Herringbone**  
Dom. Steel Products Co., Brantford, Ont.  
Hamilton Gear & Machine Co., Toronto,  
Ont.  
Philadelphia Gear Works, Philadelphia,  
Pa.

**Gears, Machine Moulded**  
Can. Steel Foundries, Montreal, Que.

**Gears, Rawhide (See Gears, Cut)**  
Hamilton Gear & Machine Co., Toronto,  
Ontario.  
Philadelphia Gear Works, Philadelphia,  
Pa.

**Gear, Silent Chain**  
Gardner & Son, Robt., Montreal, Que.  
Morse Chain Co., Ithaca, N.Y.  
Can. Link-Belt Co., Ltd., Toronto, Can.  
Hans Renold of Canada, Ltd., Montreal,  
Quebec.

**Gears, Worm**  
Dom. Steel Products Co., Brantford, Ont.  
Hamilton Gear & Machine Co., Toronto,  
Ontario.

**Generators, Acetylene**  
L'Air Liquide Society, Toronto, Ont.

**Generators, Electric**  
Holden Co., Ltd., Montreal, Que.  
Northern Electric Co., Montreal, Que.

Petrie, Ltd., H. W., Toronto, Ont.  
Sturtevant Co., B. F., Boston, Mass.

**Goggles, Safety**  
Perdue, W. B., San Francisco, Calif.  
Prest-O-Lite Co. of Can., Toronto, Ont.  
Standard Optical Co., Geneva, N.Y.  
Willson Goggles, Inc., Reading, Pa.

**Grab Buckets**  
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,  
Que.

Can. Link-Belt Co., Toronto, Ont.  
Dominion Bridge Co., Ltd., Lachine, Que.  
Morris Crane & Hoist Co., Ltd., Niagara  
Falls, Ont.

**Grease Cups, Pressed Steel and Brass**  
Can. Winkley Co., Ltd., Windsor, Ont.

**Greases, Lubricating**  
Canadian SKF Co., Toronto, Ont.  
Cateract Refining Co., Toronto, Ont.

**Grinding Discs**  
Ritchey Supply Co., Toronto, Ont.

**Grinding Machines**  
Brown & Sharpe Mfg. Co., Providence, R.I.

**Grinding Machines, Abrasive Belt**  
Reacon Engineering Co., Tipton, England.  
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Automatic**  
Pratt & Whitney Co., of Canada, Ltd.,  
Dundas, Ont.

**Grinding Machines, Bench**  
Aikenhead Hardware Ltd., Toronto, Ont.  
Blount Co., J. G., Everett, Mass.  
Ford-Smith Machine Co., Hamilton, Ont.  
Foss Machinery & Supply Co., Geo. F.,  
Montreal, Que.

Geometric Tool Co., New Haven, Conn.  
Holly, B. S., Toronto, Ont.  
La Salle Tool Co., La Salle, Ill.  
Landis Tool Co., Waynesboro, Pa.  
Morse Twist Drill & Machine Co., New  
Bedford, Mass.  
McDougall Co., Ltd., R. Galt, Ont.  
Norton Co. of Can., Ltd., Hamilton, Ont.  
Petrie, Ltd., H. W., Toronto, Ont.  
Pratt & Whitney Co., of Canada, Ltd.,  
Dundas, Ont.  
Rockford Drilling Machine Co., Rockford,  
Ill.  
Roelofson Machine & Tool Co., Toronto,  
Ont.  
Waltham Grinding Wheel Co. of Canada,  
Brantford, Ont.  
Terry & Co., John C., Birmingham, Eng.  
Steelinger Co. of Can., Ltd., Chas. A.,  
Windsor, Ont.  
Wolffson & Kompass, Hamilton, Ont.  
Williams Machinery & Supply Co., A. R.,  
Montreal, Que.

**Grinding Machines, Center**  
U.S. Electrical Tool Co., Cincinnati, O.  
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines Chaser**  
Jones & Lamson Machine Co., Spring-  
field, Vt.

**Grinding Machines, Cutter and Reamer**  
Cincinnati Milling Machine Co., Cincin-  
nati, Ohio.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Greenfield Machine Co., Greenfield, Mass.  
Herbert Ltd., Alfred, Toronto, Ont.  
Petrie, Ltd., H. W., Toronto, Ont.  
Pratt & Whitney Co., of Canada, Ltd.,  
Dundas, Ont.

**Grinding Machines, Cylindrical**  
Garlock-Walker Mch. Co., Toronto, Ont.  
Greenfield Machine Co., Greenfield, Mass.  
Pratt & Whitney Co., of Canada, Ltd.,  
Dundas, Ont.

**Grinding Machines, Die**  
Jones & Lamson Machine Co., Springfield,  
Vermont.

Murphy Machine & Tool Co., Detroit,  
Mich.  
National Acme Co., Cleveland, Ohio.  
National Machinery Co., Tiffin, Ont.

**Grinding Machines, Disc**  
Beacon Engineering Co., Tipton, England.  
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Drill**  
Reacon Engineering Co., Tipton, England.  
Bertram & Son Co., Ltd., The John,  
Dundas, Ont.  
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Face**  
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Floor and Tool**  
Reacon Engineering Co., Tipton, England.  
Blount Co., J. G., Everett, Mass.  
Ford-Smith Machine Co., Hamilton, Ont.  
Gisholt Machine Co., Madison, Wis.  
Modern Tool Co., Erie, Pa.  
National Acme Co., Cleveland, Ohio.  
Petrie, Ltd., H. W., Toronto, Ont.  
Terry & Co., John C., Birmingham, Eng.

**Grinding Machines, Internal**  
Garlock-Walker Mch. Co., Toronto, Ont.  
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Portable**  
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,  
Que.  
Cincinnati Electrical Tool Co., Cincinnati,  
Ohio.  
Cleveland Pneumatic Tool Co., Toronto, Ont.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Holden Co., Ltd., Montreal, Que.  
Independent Pneumatic Tool, Chicago, Ill.  
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Power Oscillating Tool**  
Herbert Ltd., Alfred, Toronto, Ont.

**Grinding Machines, Ring Wheel**  
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Snagging**  
Blount Co., J. G., Everett, Mass.  
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Surface**  
Garlock-Walker Mch. Co., Toronto, Ont.  
La Salle Tool Co., Ltd., La Salle, Ill.  
Petrie, Ltd., H. W., Toronto, Ont.  
Pratt & Whitney Co., of Canada, Ltd.,  
Dundas, Ont.

**Grinding Machines, Thread**  
Pratt & Whitney Co., of Canada, Ltd.,  
Dundas, Ont.

**Grinding Machinery, Tool Post**  
Foss Machinery & Supply Co., Geo. F.,  
Montreal, Que.

Gisholt Machine Co., Madison, Wis.  
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Universal**  
Foss Machinery & Supply Co., Geo. F.,  
Montreal, Que.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Gisholt Machine Co., Madison, Wis.  
La Salle Tool Co., Ltd., La Salle, Ill.  
Landis Tool Co., Waynesboro, Pa.  
Modern Tool Co., Erie, Pa.  
Morse Twist Drill & Machine Co., New  
Bedford, Mass.

Petrie, Ltd., H. W., Toronto, Ont.  
Roelofson Machine & Tool Co., Toronto,  
Ont.

Waltham Grinding Wheel Co. of Canada,  
Brantford, Ont.

**Grinding Wheels**  
Aikenhead Hardware Ltd., Toronto, Ont.  
Atkins & Co., Inc., E. C., Indianapolis, I.  
Dom. Abrasive Wheel Co., Ltd., Mimico,  
Ont.

Ford-Smith Machine Co., Hamilton, Ont.  
Norton Co. of Can., Ltd., Hamilton, Ont.  
Waltham Grinding Wheel Co. of Canada,  
Ltd., Brantford, Ont.

**Guards, Machinery and Window**  
Can. Wire & Iron Goods Co., Hamilton,  
Ont.

**Guards, Electric Lamp**  
Flexible Steel Lacing Co., Chicago, Ill.

**Gun-Barrel Machinery**  
Steinle Turret Machine Co., Madison, Wis.

**Hack Saws, Power**  
Ackworth Ltd., John, Birmingham, Eng.  
Aikenhead Hardware Ltd., Toronto, Ont.  
Atkins & Co., Inc., E. C., Indianapolis, I.  
Clemson Bros., Hamilton, Canada.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Lyman Tube & Supply Co., Montreal, Que.  
Petrie, Ltd., H. W., Toronto, Ont.  
Simonds Canada Saw Co., Montreal, Que.  
Starrett Co., L. S., Athol, Mass.  
Williams Machinery & Supply Co., A. R.,  
Montreal, Que.

**Hammers, Chipping**  
Cleveland Pneumatic Tool Co., Toronto,  
Ont.

**Hammers, Drop**  
Bertram & Son Co., Ltd., The John,  
Dundas, Ont.

Riles Co., E. W., Brooklyn, N.Y.  
Brown Rogers & Co., Ltd., Hamilton, Ont.  
Canada Foundries & Forgings Co., Wel-  
land, Ont.  
Canada Machinery Corp., Galt, Ont.

**Hammers, Electric**  
Aikenhead Hardware Ltd., Toronto, Ont.  
Brown Rogers & Co., Ltd., Hamilton, Ont.  
Holden Co., Ltd., Montreal, Que.

**Hammers, Pneumatic**  
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,  
Que.

Cleveland Pneumatic Tool Co., Toronto,  
Ont.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Holden Co., Ltd., Montreal, Que.

**Hammers, Power**  
Bertram & Son Co., Ltd., The John,  
Dundas, Ont.

Brown Rogers & Co., Ltd., Hamilton, Ont.  
Jardine & Co., A. B., Hespeler, Ont.  
Petrie, Ltd., H. W., Toronto, Ont.

**Hammers, Rivetting**  
Cleveland Pneumatic Tool Co., Toronto,  
Ont.

**Hangers, Shafting**  
Can. Link-Belt Co., Toronto, Ont.  
Canadian SKF Co., Toronto, Ont.  
Chapman Double Ball Bearing Co.,  
Toronto, Ont.  
Ford-Smith Machine Co., Hamilton, Ont.  
Foss Machinery & Supply Co., Geo. F.,  
Montreal, Que.  
Terry & Co., John C., Birmingham, Eng.  
Williams Machinery & Supply Co., A. R.,  
Montreal, Que.

**Hardening, Case-Hardening and Tem-  
pering**  
Hamilton Gear & Machine Co., Toronto,  
Ont.

**Hardness Testing Apparatus**  
Shore Instrument Co., Jamaica, N.Y.

**Heating**  
Skinner Bros. Mfg. Co., Inc., St. Louis,  
Mo.

**Hobbing Machines**  
Herbert Ltd., Alfred, Toronto, Ont.  
Petrie, Ltd., H. W., Toronto, Ont.

**Hobs**  
Armstrong-Whitworth of Canada, Ltd.,  
Montreal, Canada.  
Brown & Sharpe Mfg. Co., Providence, R.I.  
Greenfield Tap & Die Corp., Galt, Ont.  
Pratt & Whitney Co., of Canada, Ltd.,  
Dundas, Ont.

**Hoists, Electric**  
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,  
Que.

Can. Link-Belt Co., Toronto, Ont.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Morris Crane & Hoist Co., Ltd., Niagara  
Falls, Ont.

Northern Crane Works, Walkerville, Ont.  
Shepard Electric Crane & Hoist Co.,  
Montour Falls, N.Y.  
Volta Mfg. Co., Welland, Ont.

**Hoists, Hand**  
Lyman Tube & Supply Co., Montreal, Que.  
Morris Crane & Hoist Co., Ltd., Niagara  
Falls, Ont.  
Wright Mfg. Co., Lisbon, Ohio.

**Hoists, Pneumatic**  
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,  
Que.

Curtis Pneumatic Machinery Co., St.  
Louis, Mo.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Holden Co., Ltd., Montreal, Que.  
Independent Pneumatic Tool, Chicago, Ill.  
Morris Crane & Hoist Co., Ltd., Niagara  
Falls, Ont.  
Northern Crane Works, Walkerville, Ont.

**Holders-On, Pneumatic**  
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,  
Que.

Cleveland Pneumatic Tool Co., Toronto,  
Ont.

Holden Co., Ltd., Montreal, Que.  
Independent Pneumatic Tool, Chicago, Ill.

**Hose, Flexible Steel**  
Ontario Metal Products Co., Ltd., Tor-  
onto, Ont.

**Hose, Industrial**  
Dunlop Tire & Rubber Goods Co., Ltd.,  
Toronto, Ont.

Goodyear Tire & Rubber Co. of Can.,  
Ltd., Toronto, Ont.

**Hose, Rubber**  
Can. Consolidated Rubber Co., Ltd.,  
Montreal, Que.

Can. Foamite Firefoam Co., Hamilton,  
Ont.

**Hydraulic Leather**  
Grady & Knight Mfg. Co., Worcester,  
Mass.

**Hydraulic Machinery**  
Bertram & Son Co., Ltd., The John,  
Dundas, Ont.

Can. Ingersoll-Rand Co., Ltd., Sherbrooke,  
Que.

Garlock-Walker Mch. Co., Toronto, Ont.  
Stewart & Co., Duncan, Glasgow, Scot.

**Hydrogen**  
National Electro Products, Ltd., Toronto,  
Ont.

**Index Centers**  
Dickow, Fred. C., Machinery Co., Chi-  
cago, Ill.

**Igniters, Gas Engine**  
Canada Foundries & Forgings Co., Wel-  
land, Ont.

**Indicators, Speed and Test**  
Aikenhead Hardware Ltd., Toronto, Ont.  
Atkins & Co., Inc., E. C., Indianapolis, I.  
Brown & Sharpe Mfg. Co., Providence, R.I.

**Insulation**  
Diamond State Fibre Co. of Can., Ltd.,  
Toronto, Ont.

**Jacks, Hydraulic**  
Norton, A. O., Boston, Mass.

**Jacks, Planer**  
Armstrong Bros. Tool Co., Chicago, Ill.  
Starrett Co., L. S., Athol, Mass.

Bilton Machine Co., Bridgeport, Conn.  
Burgess & Marchand, Montreal, Que.  
Crescent Machine Co., Ltd., Montreal, Q.



# BUYERS' DIRECTORY

**Jigs and Fixtures (See Tool Work)**  
Fisher Motor Co. Ltd., Orillia, Ont.  
Ford-Smith Machine Co., Hamilton, Ont.  
Gisholt Machine Co., Madison, Wis.  
Hamilton Engineering Service, Ltd.,  
Hamilton, Ont.  
Rapid Tool & Machine Co., Lachine, Que.

## Keyseating Machines

Bilton Machine Co., Bridgeport, Conn.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Morton Mfg. Co., Muskegon Mich.  
Petrie, Ltd., H. W., Toronto, Ont.  
Pratt & Whitney Co., of Canada, Ltd.,  
Dundas, Ont.

## Keys, Machine

Can. Drawn Steel Co., Hamilton, Ont.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Morton Mfg. Co., Muskegon, Mich.

## Knives, Machine

Atkins & Co., Inc., E. C., Indianapolis, I.  
Canada Machinery Corp., Galt, Ont.  
Oliver Machy Co., Grand Rapids, Mich.  
Simonds Canada Saw Co., Montreal, Que.

## Knurl Holders

Pratt & Whitney Co., of Canada, Ltd.,  
Dundas, Ont.

## Lacing Leather

Chipper Belt Lacer Co., Grand Rapids,  
Mich.  
Main Belting Co. of Can., Montreal, Que.

## Lamps, Electric

Federal Eng'gng Co., Ltd., Toronto, Ont.  
Northern Electric Co., Montreal, Que.

## Lathe Attachments

Canada Machinery Corp., Galt, Ont.  
Hendey Machine Co., Torrington, Conn.  
Lehmann Machine Co., St. Louis, Mo.  
Petrie, Ltd., H. W., Toronto, Ont.

## Lathe Pans, Portable

Canada Machinery Corp., Galt, Ont.

## Lathe Tools

Armstrong Bros. Tool Co., Chicago, Ill.  
Can. Atlas Crucible Steel Co., Ltd.,  
Toronto, Ont.  
Gisholt Machine Co., Madison, Wis.  
Hendey Machine Co., Torrington, Conn.

## Lathe, Automatic and Semi-Auto-

matic  
Armstrong Whitworth of Canada, Ltd.,  
Montreal, Canada  
Gisholt Machine Co., Madison, Wis.  
Herbert Ltd., Alfred, Toronto, Ont.  
Jones & Lamson Machine Co., Spring-  
field, Vt.  
McDougall Co., Ltd., R. Galt, Ont.  
National Acme Co., Cleveland, Ohio.  
Steinle Turret Machine Co., Madison, Wis.

## Lathe, Bench

Archibald & Co., Chas. P., Montreal, Q.  
Pratt & Whitney Co., of Canada, Ltd.,  
Dundas, Ont.

## Lathe, Boring

Bertram & Son Co., Ltd., The John,  
Dundas, Ont.  
Canada Machinery Corp., Galt, Ont.  
Steinle Turret Machine Co., Madison, Wis.

## Lathe, Chucking (See Lathe, Hor-

izontal Turret, and Lathe, Ver-  
tical Turret)  
Acme Machine Tool Co., Cincinnati, Ohio.  
Bertram & Son Co., Ltd., The John,  
Dundas, Ont.  
Canada Machinery Corp., Galt, Ont.  
Gisholt Machine Co., Madison, Wis.  
Jones & Lamson Machine Co., Spring-  
field, Vermont.

McDougall Co., Ltd., R. Galt, Ont.  
Steinle Turret Machine Co., Madison, Wis.  
Warner & Swasey Co., Cleveland, Ohio.

## Lathe, Engine

Archibald & Co., Chas. P., Montreal, Q.  
Bertram & Son Co., Ltd., The John,  
Dundas, Ont.  
Canada Machinery Corp., Galt, Ont.  
Foss Machinery & Supply Co., Geo. F.,  
Montreal, Que.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Hardinge Bros., Inc., Chicago, Ill.  
Herbert Ltd., Alfred, Toronto, Ont.  
Hendey Machine Co., Torrington, Conn.  
Holly, R. S., Toronto, Ont.  
Lehmann Machine Co., St. Louis, Mo.  
McDougall Co., Ltd., R. Galt, Ont.  
Oliver Machinery Co., Grand Rapids, Mich.  
Petrie, Ltd., H. W., Toronto, Ont.  
Rockford Lathe & Drill Co., Rockford,  
Ill.  
Roelofson Machine & Tool Co., Toronto,  
Ont.  
Sidney Machine Tool Co., Sidney, Ohio.  
Strelinger Co. of Can., Ltd., Chas. A.,  
Windsor, Ont.  
Walcott Lathe Co., Jackson, Mich.  
Williams Machinery & Supply Co., A. R.,  
Montreal, Que.

## Lathe, Extension and Gap

Bertram & Son Co., Ltd., The John,  
Dundas, Ont.  
Canada Machinery Corp., Galt, Ont.  
Gisholt Machine Co., Madison, Wis.  
McDougall Co., Ltd., R. Galt, Ont.  
Oliver Machinery Co., Grand Rapids, Mich.

## Lathe, Heavy Duty Projectile Boring

Bertram & Son Co., Ltd., The John,  
Dundas, Ont.  
Flashill Wire Machy Co., Ltd., Montreal  
Sidney Machine Tool Co., Sidney, Ohio  
Steinle Turret Machine Co., Madison, Wis.

Williams Machinery & Supply Co., A. R.,  
Montreal, Que.

## Lathes, Horizontal Turret

Acme Machine Tool Co., Cincinnati, Ohio.  
Blount Co., J. G., Everett, Mass.  
Gisholt Machine Co., Madison, Wis.  
Herbert Ltd., Alfred, Toronto, Ont.  
Jones & Lamson Machine Co., Spring-  
field, Vt.  
McDougall Co., Ltd., R. Galt, Ont.  
National Acme Co., Cleveland, Ohio.  
Oliver Machinery Co., Grand Rapids, Mich.  
Petrie, Ltd., H. W., Toronto, Ont.  
Rockford Lathe & Drill Co., Rockford,  
Ill.  
Steinle Turret Machine Co., Madison, Wis.  
Warner & Swasey Co., Cleveland, Ohio.

## Lathes, Polishing (See Polishing and

Buffing Machines)  
Ford-Smith Machine Co., Hamilton, Ont.

## Lathes, Relieving

Canada Machinery Corp., Galt, Ont.  
Reeves Machine Co., Torrington, Conn.  
McDougall Co., Ltd., R. Galt, Ont.

## Lathe, Universal Hand

Brown & Sharpe Mfg. Co., Providence, R. I.

## Lathes, Screw-Cutting

Jones & Lamson Machine Co., Spring-  
field, Vt.

## Lathe, Speed and Hand

Blount Co., J. G., Everett, Mass.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Greenfield Tap & Die Corp., Galt, Ont.  
Oliver Machy Co., Grand Rapids, Mich.

## Lathes, Spinning

Terry & Co., John C., Birmingham, Eng.

## Lathes, Threading

Canada Machinery Corp., Galt, Ont.  
Greenfield Tap & Die Corp., Galt, Ont.  
Hendey Machine Co., Torrington, Conn.  
Lehmann Machine Co., St. Louis, Mo.

## Lathes, Vertical Turret

Bertram & Son Co., Ltd., The John,  
Dundas, Ont.  
Gisholt Machine Co., Madison, Wis.  
Jones & Lamson Machine Co., Springfield,  
Vermont.  
Roelofson Machine & Tool Co., Toronto,  
Ont.

## Lathe, Wood Turning

Blount Co., J. G., Everett, Mass.  
Canada Machinery Corp., Galt, Ont.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Oliver Machinery Co., Grand Rapids, Mich.  
Petrie, Ltd., H. W., Toronto, Ont.

## Lead Pipe

Steel Co. of Canada, Ltd., Hamilton, Ont.

## Lighting Fixtures

Northern Electric Co., Montreal, Que.  
Tobman Brass & Metal Co., Hamilton,  
Ont.

## Linoleum Mill Machinery

Bertrams Ltd., Edinburgh, Scotland

## Liquid Air Plants

L'Air Liquide Society, Toronto, Ont.

## Lockers, Clothes

Can. Foamite Firefoam Co., Hamilton,  
Ont.  
Dennis Wire & Iron Works, London, Ont.

## Lubricants

Cateract Refining Co., Toronto, Ont.  
Oakley Chemical Co., New York, N.Y.

## Lubricating Systems

Bowser, S. F., & Co., Ltd., Toronto, Can.

## Machinists' Small Tools

Armstrong-Whitworth of Canada, Ltd.,  
Montreal, Canada  
Bertrams Ltd., Edinburgh, Scotland.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Canada Foundries & Forgings Co., Wel-  
land, Ont.  
Can. Fairbanks-Morse Ltd., Montreal, Q.  
Dodge Mfg. Co. of Can., Toronto, Ont.  
Foss Machinery & Supply Co., Geo. F.,  
Montreal, Que.  
Ker & Goodwin Machine Co., Brantford,  
Ont.  
Petrie, Ltd., H. W., Toronto, Ont.  
Pilot Steel & Tool Co., Montreal, Que.  
Pratt & Whitney Co., of Canada, Ltd.,  
Dundas, Ont.  
Rapid Tool & Machine Co., Lachine, Que.  
Rice Lewis & Son, Ltd., Toronto, Ont.  
Rockford Milling Machine Co., Rockford,  
Ill.  
Starrett Co., L. S., Athol, Mass.  
Strelinger Co. of Can., Ltd., Chas. A.,  
Windsor, Ont.  
Wheel Tracing Tool Co., Detroit, Mich.  
Williams Machinery Co., A. R., Toronto,  
Ont.  
Williams Machinery & Supply Co., A. R.,  
Montreal, Que.

## Manganese Steel

Can. Steel Foundries, Montreal, Que.

## Mandrels, Expanding

Pratt & Whitney Co., of Canada, Ltd.,  
Dundas, Ont.

## Mandrels, Solid

Atkins & Co., Inc., E. C., Indianapolis, I.  
Cleveland Twist Drill Co., Cleveland, O.  
Pratt & Whitney Co., of Canada, Ltd.,  
Dundas, Ont.

## Measuring Machines

Pratt & Whitney Co., of Canada, Ltd.,  
Dundas, Ont.

## Metals, Alloy

British Smelting & Refining Co., Ltd.,  
Montreal, Que.  
Brown's Copper & Brass Rolling Mills,  
Ltd., Toronto, Ont.  
Canada Metal Co., Ltd., Toronto, Ont.  
Can. Atlas Crucible Steel Co., Ltd.,  
Toronto, Ont.  
Can. Steel Foundries, Montreal, Que.  
Deloro Smelting & Refining Co., Ltd.,  
Toronto, Ont.  
Fisher Motor Co., Ltd., Orillia, Ont.  
Host Metal Co., Toronto, Ont.  
International Nickel Co. of Can., Ltd.,  
Toronto, Ont.  
Magnolia Metal Co., Montreal, Que.  
Moore & Son, Thos., Montreal, Que.  
Pilot Steel & Tool Co., Montreal, Que.  
Tallman Brass & Metal, Ltd., Hamil-  
ton, Ontario.  
Walker & Sons Metal Products, Ltd.,  
Hiram, Walkerville, Ont.

## Metalite Cloth

Ritchey Supply Co., Toronto, Ont.

## Micrometer Calipers

Aikenhead Hardware Ltd., Toronto, Ont.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Rice Lewis & Son, Ltd., Toronto, Ont.

## Milling Attachments

Accorkworth, Ltd., John, Birmingham, Eng.  
Cincinnati Milling Machine Co., Cincin-  
nati, Ohio  
Ford-Smith Machine Co., Hamilton, Ont.  
Hendey Machine Co., Torrington, Conn.  
Kearney & Trecker Co., Milwaukee, Wis.  
Kemp Smith Mfg. Co., Milwaukee, Wis.  
Petrie, Ltd., H. W., Toronto, Ont.

## Milling Machines

Brown & Sharpe Mfg. Co., Providence, R. I.

## Milling Machines, Automatic

Bilton Machine Co., Bridgeport, Conn.  
Cincinnati Milling Machine Co., Cincin-  
nati, Ohio.  
Pratt & Whitney Co., of Canada, Ltd.,  
Dundas, Ont.  
Terry & Co., John C., Birmingham, Eng.

## Milling Machines, Bench

Burke Machine Tool Co., Connecticut, Ohio.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Rockford Milling Machine Co., Rockford,  
Ill.  
Terry & Co., John C., Birmingham, Eng.

## Milling Machines, Hand

Burke Machine Tool Co., Connecticut, Ohio.  
Pratt & Whitney Co., of Canada, Ltd.,  
Dundas, Ont.  
Rockford Milling Machine Co., Rockford,  
Ill.  
Terry & Co., John C., Birmingham, Eng.  
United States Machine Tool Co., Cin-  
cinnati, Ohio.

## Milling Machines, Horizontal and

Planer Type  
Bertram & Son Co., Ltd., The John,  
Dundas, Ont.  
Can. Fairbanks-Morse Ltd., Montreal, Q.  
Cleveland Milling Machine Co., Cleveland,  
Ohio.  
Ford-Smith Machine Co., Hamilton, Ont.  
Gooley Edmund Inc., Cortland, N.Y.  
Herbert Ltd., Alfred, Toronto, Ont.  
Kearney & Trecker Co., Milwaukee, Wis.  
Rockford Milling Machine Co., Rockford,  
Ill.  
Roelofson Machine & Tool Co., Toronto,  
Ont.  
Williams Machinery Co., A. R., Toronto,  
Ont.

## Milling Machines, Plain

Bilton Machine Co., Bridgeport, Conn.  
Cincinnati Milling Machine Co., Cincin-  
nati, Ohio.  
Cleveland Milling Machine Co., Cleveland,  
Ohio.  
Ford-Smith Machine Co., Hamilton, Ont.  
Foss Machinery & Supply Co., Geo. F.,  
Montreal, Que.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Gooley Edmund Inc., Cortland, N.Y.  
Hendey Machine Co., Torrington, Conn.  
Herbert Ltd., Alfred, Toronto, Ont.  
Kearney & Trecker Co., Milwaukee, Wis.  
Kemp Smith Mfg. Co., Milwaukee, Wis.  
Petrie, Ltd., H. W., Toronto, Ont.  
Rockford Milling Machine Co., Rockford,  
Ill.  
Terry & Co., John C., Birmingham, Eng.

## Milling Machines, Thread

Pratt & Whitney Co., of Canada, Ltd.,  
Dundas, Ont.

## Milling Machines, Universal

Armstrong-Whitworth of Canada, Ltd.,  
Montreal, Canada  
Cincinnati Milling Machine Co., Cincin-  
nati, Ohio.  
Ford-Smith Machine Co., Hamilton, Ont.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Hendey Machine Co., Torrington, Conn.  
Holly, R. S., Toronto, Ont.  
Herbert Ltd., Alfred, Toronto, Ont.  
Kearney & Trecker Co., Milwaukee, Wis.  
Kemp Smith Mfg. Co., Milwaukee, Wis.  
Petrie, Ltd., H. W., Toronto, Ont.  
Rockford Milling Machine Co., Rockford,  
Ill.

Roelofson Machine & Tool Co., Toronto,  
Ont.  
Williams Machinery & Supply Co., A. R.,  
Montreal, Que.

## Milling Machines, Vertical

Cincinnati Milling Machine Co., Cincin-  
nati, Ohio.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Herbert Ltd., Alfred, Toronto, Ont.  
Kearney & Trecker Co., Milwaukee, Wis.  
Kemp Smith Mfg. Co., Milwaukee, Wis.  
Rockford Milling Machine Co., Rockford,  
Ill.  
Williams Machinery Co., A. R., Toronto,  
Ont.

## Monel Metal

International Nickel Co. of Can., Ltd.,  
Toronto, Ont.

## Motors, Electric

Atkins & Co., Inc., E. C., Indianapolis, I.  
Garlock-Walker Mch. Co., Toronto, Ont.  
MacGovern & Co., Montreal, Que.  
Northern Electric Co., Montreal, Que.  
Petrie, Ltd., H. W., Toronto, Ont.  
Sturtevant Co., B. F., Boston, Mass.  
Williams Machinery Co., A. R., Toronto,  
Ont.  
Wisconsin Electric Co., Racine, Wis.

## Moulded Rubber Goods

Can. Consolidated Rubber Co., Ltd.,  
Montreal, Que.

## Nail Machinery

Sleeper & Hatley, Inc., Worcester, Mass.

## Nails and Staples

Steel Co. of Canada, Ltd., Hamilton, Ont.

## Nickel, Bars, Sheets, Wire, Etc.

International Nickel Co. of Can., Ltd.,  
Toronto, Ont.

## Nickel Plating Outfits

Walker & Sons Metal Products, Ltd.,  
Hiram, Walkerville, Ont.

## Nickel Silver

Brown's Copper & Brass Rolling Mills,  
Ltd., Toronto, Ont.

## Nitrogen

L'Air Liquide Society, Toronto, Ont.

## Nut Tappers (See Bolt and Nut Ma-

chinery)  
Acme Machinery Co., Cleveland, Ohio.  
Bertram & Son Co., Ltd., The John,  
Dundas, Ont.  
Greenfield Tap & Die Corp., Galt, Ont.  
National Acme Co., Cleveland, Ohio.

## Nuts, Finished and Semi-finished

Galt Machine Screw Co., Galt, Ont.

## Nuts, S.A.E., Plain and Castellated

Galt Machine Screw Co., Galt, Ont.

## Oil Filtering and Storage Systems

Bowser, S. F., & Co., Ltd., Toronto, Can.

## Oil Storage Engineers

Bowser, S. F., & Co., Ltd., Toronto, Can.

## Oils

Canadian Oil Companies, Ltd., Toronto,  
Ont.  
Cateract Refining Co., Toronto, Ont.  
Imperial Oil Ltd., Toronto, Ont.

## Oil Hole Covers

Can. Winkley Co., Ltd., Windsor, Ont.

## Oils, Soluble

Cateract Refining Co., Toronto, Ont.  
Imperial Oil Ltd., Toronto, Ont.

## Oxygen

Carter Welding Co., Toronto, Ont.  
Dominion Oxygen Co., Toronto, Ont.  
L'Air Liquide Society, Toronto, Ont.

## Oxy-Acetylene Apparatus

L'Air Liquide Society, Toronto, Ont.

## Packing, Hydraulic

Can. Consolidated Rubber Co., Ltd.,  
Montreal, Que.  
Graton & Knight Mfg. Co., Worcester,  
Mass.  
Gulldford & Sons, Ltd., Halifax, N.S.

## Packing, Steam

Can. Consolidated Rubber Co., Ltd.,  
Montreal, Que.  
Graton & Knight Mfg. Co., Worcester,  
Mass.  
Gulldford & Sons, Ltd., Halifax, N.S.

## Paper Mill Conveyors

Bertrams Ltd., Edinburgh, Scotland.

## Patents

Fetherstonhaugh & Co., Ottawa, Ont.  
Marion & Marion, Montreal, Que.

## Pans, Wet and Dry

Frost Mfg. Co., Chicago, Ill.

## Pattern-Shop Machinery (See Wood-

working Machinery)  
Canada Machinery Corp., Galt, Ont.  
Oliver Machinery Co., Grand Rapids, Mich.

## Patterns, Wood and Metal

Crescent Machine Co., Ltd., Montreal, Q.  
Victoria Foundry Co., Ltd., Ottawa, Ont.  
Wragg Pattern Works, Galt, Ont.

## Penstocks, Steel

MacInnon Steel Co., Sherbrooke, Que.



# BUYERS' DIRECTORY

**Phosphor Tin**  
British Smelting & Refining Co., Ltd.  
Montreal, Que.

**Photographic Duplicating Machines**  
Commercial Camera Co., Providence, R.I.

**Pig Iron**  
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Bending Machines**  
American Pipe Bending Machine Co.,  
Boston, Mass.  
Underwood Corp., H. B., Philadelphia,  
Pa.  
Williams Machinery Co., A. R., Toronto,  
Ont.

**Pipe Couplings**  
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Cutting and Threading Machines**  
Crane Ltd., Montreal, Que.  
Greenfield Tap & Die Corp., Galt, Ont.  
Jardine & Co., A. B., Hespeler, Ont.  
Landis Machine Co., Inc., Waynesboro, Pa.  
Murphy Machine & Tool Co., Detroit,  
Mich.  
McDougall Co., Ltd., R. Galt, Ont.  
Petrie, Ltd., H. W., Toronto, Ont.  
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Pipe and Nipple Threading Machines**  
Landis Machine Co., Inc., Waynesboro, Pa.

**Pipe Fitters' Tools**  
Aikenhead Hardware Ltd., Toronto, Ont.  
Crane Ltd., Montreal, Que.  
Rice Lewis & Son, Ltd., Toronto, Ont.

**Pipe Threading Die Heads**  
Landis Machine Co., Inc., Waynesboro, Pa.

**Piston-Ring Machines**  
National Acme Co., Cleveland, Ohio.  
Steinle Turret Machine Co., Madison, Wis.

**Planers, Parallel**  
L. & P. Mfg. Co., Niagara Falls, Ont.

**Planing Machines**  
Bertram & Son Co., Ltd., The John  
Dundas, Ont.  
Canada Machinery Corp., Galt, Ont.  
Foss Machinery & Supply Co., Geo. F.,  
Montreal, Que.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Hepburn Ltd., John T., Toronto, Ont.  
Herbert Ltd., Alfred, Toronto, Ont.  
L. & P. Mfg. Co., Niagara Falls, Ont.  
Morton Mfg. Co., Muskegon, Mich.  
Oliver Machinery Co., Grand Rapids, Mich.  
Williams Machinery Co., A. R., Toronto,  
Ont.

**Planing Machines, Rotary**  
Bertram & Son Co., Ltd., The John  
Dundas, Ont.  
Canada Machinery Corp., Galt, Ont.

**Plate Rolls**  
Bertram & Son Co., Ltd., The John  
Dundas, Ont.

**Pneumatic Tools**  
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.  
Cleveland Pneumatic Tool Co., Toronto, Ont.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Holden Co., Ltd., Montreal, Que.  
Independent Pneumatic Tool, Chicago, Ill.  
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Polishing and Buffing Machines**  
Ackworth Ltd., John, Birmingham, Eng.  
Archibald & Co., Chas. P., Montreal, Q.  
Blount Co., J. G., Everett, Mass.  
Brown & Sharpe Mfg. Co., Providence, R.I.  
Can. Hanson & Van Winkle Co., Ltd.,  
Toronto, Ont.  
Ford-Smith Machine Co., Hamilton, Ont.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Terry & Co., John C., Birmingham, Eng.

**Pots, Steel**  
Swedish Crucible Steel Co. of Canada,  
Ltd., Windsor, Ont.

**Pressed Steel Parts**  
Ackworth Ltd., John, Birmingham, Eng.  
American Pulley Co., Philadelphia, Pa.  
Fisher Motor Co., Ltd., Orillia, Ont.

**Presses, Arbor**  
Atlas Press Co., Kalamazoo, Mich.  
National Engineering Co., Sarnia, Ont.  
Petrie, Ltd., H. W., Toronto, Ont.  
Strelinger Co. of Can., Ltd., Chas. A.,  
Windsor, Ont.

**Presses, Drop and Forging**  
Brown, Boggs & Co., Ltd., Hamilton, Ont.  
Canada Foundries & Forgings Co., Welland, Ont.  
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Foot and Hand**  
Brown, Boggs & Co., Ltd., Hamilton, Ont.  
Terry & Co., John C., Birmingham, Eng.

**Presses, Forcing**  
Atlas Press Co., Kalamazoo, Mich.  
Stewart & Co., Duncan, Glasgow, Scot.

**Presses, Hydraulic**  
Baird Machine Co., Bridgeport, Conn.  
Bertram & Son Co., Ltd., The John  
Dundas, Ont.  
Can. Ingersoll-Rand Co., Ltd., Sherbrooke,  
Que.

**Presses, Power**  
Atlas Mfg. Co., Springfield, Ill.  
Perrin Ltd., W. R., Toronto, Ont.  
Stewart & Co., Duncan, Glasgow, Scot.  
Williams Machinery Co., A. R., Toronto,  
Ont.

**Presses, Power**  
Bliss Co., E. W., Brooklyn, N.Y.  
Brown, Boggs & Co., Ltd., Hamilton, Ont.

Canada Machinery Corp., Galt, Ont.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Hepburn Ltd., John T., Toronto, Ont.  
Henry & Wright Mfg. Co., Hartford, Conn.  
Petrie, Ltd., H. W., Toronto, Ont.  
Stall Co., Inc., D. H., Buffalo, N.Y.  
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Screw**  
Brown, Boggs & Co., Ltd., Hamilton, Ont.  
Petrie, Ltd., H. W., Toronto, Ont.

**Profiling Machines**  
Aikenhead Hardware Ltd., Toronto, Ont.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Pratt & Whitney Co. of Canada, Ltd.,  
Dundas, Ont.

**Protractors**  
Brown & Sharpe Mfg. Co., Providence, R.I.

**Propellers**  
Kennedy & Sons, Wm., Owen Sound, Ont.

**Pulleys, Cork Insert**  
American Pulley Co., Philadelphia, Pa.  
Foss Machinery & Supply Co., Geo. F.,  
Montreal, Que.  
Positive Clutch & Pulley Works, Toronto, Ont.

**Pulleys, Metal and Fibre**  
American Pulley Co., Philadelphia, Pa.  
Bernard Industrial Co., A., Forterville, Que.  
Can. Fairbanks-Morse Ltd., Montreal, Q.  
Canadian SKF Co., Toronto, Ont.  
Diamond State Fibre Co. of Can., Ltd.,  
Toronto, Ont.  
Johnson Machine Co., Carlyle, Manchester, Conn.  
Kennedy & Sons, Wm., Owen Sound, Ont.  
Williams Machinery & Supply Co., A. R.,  
Montreal, Que.

**Pulp and Paper Mill Equipment**  
MacKinnon Steel Co., Sherbrooke, Que.

**Pumps, Automobile Tire**  
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Pumps, Barrel and Boiler-feed**  
Trahern Pump Co., Rockford, Ill.

**Pumps, Circulating and Coalant**  
Trahern Pump Co., Rockford, Ill.

**Pumps, Geared and Hand**  
Trahern Pump Co., Rockford, Ill.

**Pumps, Industrial**  
Trahern Pump Co., Rockford, Ill.

**Pumps, Hydraulic**  
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.  
Electric Steel & Engineering Co., Welland, Ont.  
Hepburn Ltd., John T., Toronto, Ont.  
Holden Co., Ltd., Montreal, Que.  
Stewart & Co., Duncan, Glasgow, Scot.  
Trahern Pump Co., Rockford, Ill.

**Pumps, Lubricant and Oil**  
Bowser, S. F. & Co., Ltd., Toronto, Can.  
Can. Blower & Forge Co., Ltd., Kitchener.  
Hepburn Ltd., John T., Toronto, Ont.  
McDougall Co., Ltd., R. Galt, Ont.  
Trahern Pump Co., Rockford, Ill.

**Pumps, Power**  
Bowser, S. F. & Co., Ltd., Toronto, Can.  
Can. Blower & Forge Co., Ltd., Kitchener.  
Can. Fairbanks-Morse Ltd., Montreal, Q.  
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.  
Hepburn Ltd., John T., Toronto, Ont.  
Trahern Pump Co., Rockford, Ill.

**Punches, Center**  
Brown & Sharpe Mfg. Co., Providence, R.I.  
Pratt & Whitney Co. of Canada, Ltd.,  
Dundas, Ont.  
Starrett Co., L. S., Athol, Mass.

**Punches, Hand**  
Brown, Boggs & Co., Ltd., Hamilton, Ont.  
Can. Blower & Forge Co., Ltd., Kitchener.  
Jardine & Co., A. B., Hespeler, Ont.

**Punches, Power**  
Brown, Boggs & Co., Ltd., Hamilton, Ont.  
Canada Machinery Corp., Galt, Ont.  
Can. Blower & Forge Co., Ltd., Kitchener.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Petrie, Ltd., H. W., Toronto, Ont.  
Toledo Machine & Tool Co., Toledo, Ohio.

**Punching Machines, Horizontal**  
Bertrams Ltd., Edinburgh, Scotland.

**Pyrometers, Electric**  
Bristol Co., Waterbury, Conn.  
General Combustion Co. of Can., Ltd.,  
Montreal, Que.  
Walker & Sons Metal Products, Ltd.,  
Hiram, Walkerville, Ont.

**Racks, Cut**  
Ford-Smith Machine Co., Hamilton, Ont.  
Hamilton Gear & Machine Co., Toronto, Ont.

**Racks, Storage (See Furniture, Machine Shop)**  
Brantford Oven & Rack Co., Brantford, Ont.

**Rammers, Foundry**  
Holden Co., Ltd., Montreal, Que.

**Reamer Holders**  
Cleveland Twist Drill Co., Cleveland, O.

Gisholt Machine Co., Madison, Wis.  
Victor Tool Co., Waynesboro, Pa.

**Reamers, Expanding**  
Aikenhead Hardware Ltd., Toronto, Ont.  
Can. Detroit Twist Drill Co., Walkerville, Ont.  
Cleveland Twist Drill Co., Cleveland, O.  
Gisholt Machine Co., Madison, Wis.  
Greenfield Tap & Die Corp., Galt, Ont.  
Ingersoll Machine & Tool Co., Ltd.,  
Ingersoll, Ont.  
McCroskey Tool Corp., Meadville, Pa.  
Pratt & Whitney Co. of Canada, Ltd.,  
Dundas, Ont.

**Reamers, Solid**  
Armstrong Whitworth Co. of Can., Ltd.,  
Montreal, Que.  
Butterfield & Co., Inc., Rock Island, Que.  
Can. Detroit Twist Drill Co., Walkerville, Ont.  
Cleveland Twist Drill Co., Cleveland, O.  
Foss Machinery & Supply Co., Geo. F.,  
Montreal, Que.  
Greenfield Tap & Die Corp., Galt, Ont.  
Ingersoll Machine & Tool Co., Ltd.,  
Ingersoll, Ont.  
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Reamers, Taper**  
Butterfield & Co., Inc., Rock Island, Que.  
Can. Detroit Twist Drill Co., Walkerville, Ont.  
Cleveland Twist Drill Co., Cleveland, O.  
Foss Machinery & Supply Co., Geo. F.,  
Montreal, Que.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Gisholt Machine Co., Madison, Wis.  
Greenfield Tap & Die Corp., Galt, Ont.  
Ingersoll Machine & Tool Co., Ltd.,  
Ingersoll, Ont.  
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.  
Pilot Steel & Tool Co., Montreal, Que.  
Pratt & Whitney Co. of Canada, Ltd.,  
Dundas, Ont.

**Recorders, Temperature**  
Taylor Instrument Co., Rochester, N.Y.  
Walker & Sons Metal Products, Ltd.,  
Hiram, Walkerville, Ont.

**Recorders, Time**  
Gisholt Machine Co., Madison, Wis.  
International Business Machines Co., Toronto, Ont.

**Regulators, Automatic (for electric furnaces)**  
Volta Mfg. Co., Welland, Ont.

**Rheostats**  
Northern Electric Co., Montreal, Que.

**Resistance Materials**  
Walker & Sons Metal Products, Ltd.,  
Hiram, Walkerville, Ont.

**Respirators**  
Willson Goggles, Inc., Reading, Pa.

**Rivets**  
Parmenter & Bulloch Co., Gananoque, Ont.  
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Rivet Heaters**  
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.  
General Combustion Co. of Can., Ltd.,  
Montreal, Que.  
Volta Mfg. Co., Welland, Ont.

**Rivet-Making Machinery**  
Acme Machinery Co., Cleveland, Ohio.  
Bertram & Son Co., Ltd., The John  
Dundas, Ont.  
National Machinery Co., Tiffin, Ohio.

**Riveting Machines**  
Bilton Machine Co., Bridgeport, Conn.  
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.  
High Speed Hammer Co., Rochester, N.Y.  
Holden Co., Ltd., Montreal, Que.  
Independent Pneumatic Tool, Chicago, Ill.  
Keller Pneumatic Tool Co., Grand Haven, Mich.  
Parmenter & Bulloch Co., Gananoque, Ont.  
Petrie, Ltd., H. W., Toronto, Ont.  
Schuster Co., F. B., New Haven, Conn.

**Rolling Mill Equipment**  
Stewart & Co., Duncan, Glasgow, Scot.

**Rolls (Rubber Covered)**  
Can. Consolidated Rubber Co., Ltd.,  
Montreal, Que.

**Rudder Frames, Steel**  
Can. Steel Foundries, Montreal, Que.  
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Rubber Gaskets, Mechanical**  
Quaker City Rubber Co., Philadelphia, Pa.

**Rules, Steel**  
Chesterman & Co., Ltd., J., Sheffield, Eng.

**Rules, Steel and Wood**  
Brown & Sharpe Mfg. Co., Providence, R.I.

**Rust Preventatives**  
Oakley Chemical Co., New York, N.Y.

**Sand Equipment**  
Can. Link-Belt Co., Toronto, Ont.

**Sand Mills**  
Frost Mfg. Co., Chicago, Ill.

**Sanding Machinery**  
Oliver Machy. Co., Grand Rapids, Mich.

**Sand Rammers, Pneumatic**  
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.  
Cleveland Pneumatic Tool Co., Toronto, Ont.  
Holden Co., Ltd., Montreal, Que.  
Independent Pneumatic Tool, Chicago, Ill.  
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Saw Frames and Blades, Hack**  
Aikenhead Hardware Ltd., Toronto, Ont.  
Atkins & Co., Inc., E. C., Indianapolis, I.  
Clemson Bros., Inc., Hamilton, Ont.  
Diamond Saw & Stamping Works, Buffalo, N.Y.  
Foss Machinery & Supply Co., Geo. F.,  
Montreal, Que.  
Rice Lewis & Son, Ltd., Toronto, Ont.  
Simonds Canada Saw Co., Montreal, Que.

**Sawing Machines, Metal**  
Atkins & Co., Inc., E. C., Indianapolis, I.  
Foss Machinery & Supply Co., Geo. F.,  
Montreal, Que.  
Herbert Ltd., Alfred, Toronto, Ont.  
Lyman Tube & Supply Co., Montreal, Que.

**Sawing Machines, Power Hack**  
Ackworth Ltd., John, Birmingham, Eng.  
Atkins & Co., Inc., E. C., Indianapolis, I.  
Williams Machinery & Supply Co., A. R.,  
Montreal, Que.

**Saw Sharpening Machines**  
Atkins & Co., Inc., E. C., Indianapolis, I.  
Oliver Machinery Co., Grand Rapids, Mich.

**Saw Tables, Universal**  
Atkins & Co., Inc., E. C., Indianapolis, I.  
Canada Machinery Corp., Galt, Ont.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Oliver Machinery Co., Grand Rapids, Mich.  
Petrie, Ltd., H. W., Toronto, Ont.

**Saws, Circular Metal**  
Atkins & Co., Inc., E. C., Indianapolis, I.  
Simonds Canada Saw Co., Montreal, Que.  
Tabor Mfg. Co., Philadelphia, Pa.

**Saws, Hand**  
Aikenhead Hardware Ltd., Toronto, Ont.  
Atkins & Co., Inc., E. C., Indianapolis, I.  
Simonds Canada Saw Co., Montreal, Que.

**Saws, Hot and Cold**  
Atkins & Co., Inc., E. C., Indianapolis, I.  
Simonds Canada Saw Co., Montreal, Que.  
Stewart & Co., Duncan, Glasgow, Scot.

**Saws, High Speed Steel**  
Armstrong-Whitworth of Canada, Ltd.,  
Montreal, Canada.  
Atkins & Co., Inc., E. C., Indianapolis, I.  
Butterfield & Co., Inc., Rock Island, Que.  
Clemson Bros., Hamilton, Canada.  
Pratt & Whitney Co. of Canada, Ltd.,  
Dundas, Ont.  
Simonds Canada Saw Co., Montreal, Que.

**Saws, Metal Band**  
Atkins & Co., Inc., E. C., Indianapolis, I.  
Oliver Machinery Co., Grand Rapids, Mich.

**Saws, Metal, Power**  
Clemson Bros., Inc., Hamilton, Ont.

**Saws, Metal Cutting**  
Atkins & Co., Inc., E. C., Indianapolis, I.  
Brown & Sharpe Mfg. Co., Providence, R.I.  
Butterfield & Co., Inc., Rock Island, Que.  
Clemson Bros., Inc., Hamilton, Ont.  
Lyman Tube & Supply Co., Montreal, Que.  
Pratt & Whitney Co. of Canada, Ltd.,  
Dundas, Ont.  
Simonds Canada Saw Co., Montreal, Que.  
Starrett Co., L. S., Athol, Mass.

**Saws, Milling**  
Atkins & Co., Inc., E. C., Indianapolis, I.  
Butterfield & Co., Inc., Rock Island, Que.  
Ingersoll Machine & Tool Co., Ltd.,  
Ingersoll, Ont.  
Pratt & Whitney Co. of Canada, Ltd.,  
Dundas, Ont.

**Saws, Screw Slotting**  
Atkins & Co., Inc., E. C., Indianapolis, I.  
Butterfield & Co., Inc., Rock Island, Que.  
Pratt & Whitney Co. of Canada, Ltd.,  
Dundas, Ont.  
Simonds Canada Saw Co., Montreal, Que.

**Saws, Swing Cut-off**  
Oliver Machinery Co., Grand Rapids, Mich.

**Scales**  
Brown & Sharpe Mfg. Co., Providence, R.I.  
Can. Fairbanks-Morse Ltd., Montreal, Q.

**Screens**  
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Screw Driving Machine**  
Canada Machinery Corp., Galt, Ont.  
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Screw Extractors**  
Holden Co., Ltd., Montreal, Que.  
Independent Pneumatic Tool, Chicago, Ill.

**Screw Machine Work**  
Barnes Co., Wallace, Bristol, Conn.  
Cook Co., Ass. S., Hartford, Conn.  
National Acme Co., Cleveland, Ohio.  
Tallman Brass & Metal Co., Hamilton, Ont.



# BUYERS' DIRECTORY

**Screw Machinery, Wood and Lag**  
Cook Co., Asa S., Hartford, Conn.

## Screw Machines

Brown & Sharpe Mfg. Co., Providence, R. I.

## Screw Machines, Automatic

Garlock-Walker Mch. Co., Toronto, Ont.  
Herbert Ltd., Alfred, Toronto, Ont.  
National Acme Co., Cleveland, Ohio.

## Screw Machines, Plain or Hand

Acme Machine Tool Co., Cincinnati, Ohio.  
Greenfield Tap & Die Corp., Galt, Ont.  
Herbert Ltd., Alfred, Toronto, Ont.  
Jones & Lamson Machine Co., Springfield, Vermont.

Prairie & Whitney Co., of Canada, Ltd., Dundas, Ont.  
Warner & Swasey Co., Cleveland, Ohio.

## Screw Plates

Aikenhead Hardware Ltd., Toronto, Ont.  
Butterfield & Co., Inc., Rock Island, Que.  
Greenfield Tap & Die Corp., Galt, Ont.  
Jardine & Co., A. B., Hespeler, Ont.

## Screws, Cap and Set

Galt Machine Screw Co., Galt, Ont.  
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.  
National Acme Co., Cleveland, Ohio.

## Screws, Machine

Barnes Co., Wallace, Bristol, Conn.  
Steel Co. of Canada, Ltd., Hamilton, Ont.

## Screws, Safety Set

Barnes Co., Wallace, Bristol, Conn.  
Galt Machine Screw Co., Galt, Ont.  
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

## Second-Hand Machinery

(See Searchlight Section)  
Petrie, Ltd., H. W., Toronto, Ont.

## Separators, Moisture and Oil

Bowser S. F. & Co., Ltd., Toronto, Can.  
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

## Separators, Oil and Waste

Bowser, S. F., & Co., Ltd., Toronto, Can.

## Shafting

Canada Foundries & Forgings Co., Welland, Ont.  
Can. Drawn Steel Co., Hamilton, Ont.  
N.S. Steel Co., Ltd., New Glasgow, N.S.  
Williams Machinery Co., A. R., Toronto, Ont.  
Williams Machinery & Supply Co., A. R., Montreal, Que.

## Shapes, Cold-Drawn Special Steel

Union Drawn Steel Co., Hamilton, Ont.

## Shaping Machines

Canada Machinery Corp., Galt, Ont.  
Foss Machinery & Supply Co., Geo. F., Montreal, Que.  
Hendey Machine Co., Torrington, Conn.  
Herbert Ltd., Alfred, Toronto, Ont.  
Holly, R. S., Toronto, Ont.  
Morton Mfg. Co., Muskegon, Mich.  
McDougall Co., Ltd., R., Galt, Ont.  
Roelofson Machine & Tool Co., Toronto, Ont.  
Smith & Mills Co., Cincinnati, Ohio.  
Walcott Lathe Co., Jackson, Mich.  
Williams Machinery Co., A. R., Toronto, Ont.

## Shapers, Wood

Oliver Machinery Co., Grand Rapids, Mich.

## Shears, Hand

Can. Blower & Forge Co., Ltd., Kitchener.

## Shears, Power

Bliss Co., E. W., Brooklyn, N.Y.  
Brown, Boggs & Co., Ltd., Hamilton, Ont.  
Canada Machinery Corp., Galt, Ont.  
Can. Blower & Forge Co., Ltd., Kitchener.  
Stall Co., Inc., D. H., Buffalo, N.Y.  
Terry & Co., Duncan, Glasgow, Scot.  
Toledo Machine & Tool Co., Toledo, Ohio.  
Williams Machinery Co., A. R., Toronto, Ont.

## Shearing Machines, Angle, Iron Bar and Gate

Bertrams Ltd., Edinburgh, Scotland.

## Sheet Metal Working Machinery

Bliss Co., E. W., Brooklyn, N.Y.  
Brown, Boggs & Co., Ltd., Hamilton, Ont.  
Garlock-Walker Mch. Co., Toronto, Ont.  
Herbert Ltd., Alfred, Toronto, Ont.  
Stall Co., Inc., D. H., Buffalo, N.Y.  
Terry & Co., John C., Birmingham, Eng.  
Toledo Machine & Tool Co., Toledo, Ohio.

## Sheets, Nickel, Resist, Alloy

International Nickel Co. of Can., Ltd., Toronto, Ont.

## Sheets, Nickel, Monel and Fibre

Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

## Side Frames, Locomotive

Can. Steel Foundries, Montreal, Que.  
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

## Slotting Attachments

Ford-Smith Machine Co., Ltd., Hamilton, Ont.  
Kearney & Trecker Co., Milwaukee, Wis.  
Kempson Mfg. Co., Milwaukee, Wis.  
National Acme Co., Cleveland, Ohio.

## Slotting Machines

Bertram & Son Co., Ltd., The John, Dundas, Ont.  
Canada Machinery Corp., Galt, Ont.  
Ford-Smith Machine Co., Hamilton, Ont.  
Herbert Ltd., Alfred, Toronto, Ont.

## Solders

British Smelting & Refining Co., Ltd., Montreal, Que.  
Host Metal Co., Toronto, Canada.

## Snap Flasks

Oliver Machinery Co., Grand Rapids, Mich.

## Special Machinery and Tools

Brown Engineering Corp., Ltd., Toronto.  
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.  
Crescent Machine Co., Ltd., Montreal, Q.  
Ford-Smith Machine Co., Hamilton, Ont.  
Gisholt Machine Co., Madison, Wis.  
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.  
National Acme Co., Cleveland, Ohio.

## Spectacles, Industrial

Willson Goggles, Inc., Reading, Pa.

## Spring

Barnes Co., Wallace, Bristol, Conn.  
Cleveland Wire Spring Co., Cleveland, O.  
Dunbar Bros. Co., Bristol, Conn.  
Steele Ltd., James, Guelph, Ont.

## Spring-making Machinery

Sleeper & Hartley, Inc., Worcester, Mass.

## Sprockets and Chains

Can. Link-Belt Co., Toronto, Ont.  
Jones & Glassco, Montreal, Que.  
Lyman Tube & Supply Co., Montreal, Que.  
Morse Chain Co., Ithaca, N.Y.  
Renold (Hans) of Canada, Ltd., Montreal, Que.

## Squares

Brown & Sharpe Mfg. Co., Providence, R. I.

## Stamping, Metal

American Pulley Co., Philadelphia, Pa.  
Barnes Co., Wallace, Bristol, Conn.  
Diamond Saw & Stamping Works, Buffalo, N.Y.  
Fisher Motor Co., Ltd., Orillia, Ont.  
Keller Pneumatic Tool Co., Grand Haven, Mich.  
Permer & Bullock Co., Gananoque, Ont.  
Tallman Brass & Metal Co., Hamilton, Ont.

## Stamps, Steel

Diamond Saw & Stamping Works, Buffalo, N.Y.

## Stairways, Wrought Iron

Can. Wire & Iron Goods Co., Hamilton, Ont.

## Steam Specialties

Crane Ltd., Montreal, Que.

## Steel Plate

Dom. Foundries & Steel, Hamilton, Ont.

## Steels, Tool

Can. Atlas Crucible Steel Co., Toronto, Ont.  
Vulcan Crucible Steel Co., Alliquippa, Pa.

## Steel Blooms and Billets

Steel Co. of Canada, Ltd., Hamilton, Ont.

## Steel, Cold-Rolled Strip

Andrews Steel Co., Newport, Ky.  
Barnes Co., Wallace, Bristol, Conn.  
Can. Driver-Harris Co., Walkerville, Ont.  
Firth & Sons, Ltd., Thos., Montreal, Q.  
Ontario Metal Products Co., Ltd., Toronto, Ont.

## Steel Castings

Dom. Foundries & Steel, Hamilton, Ont.

## Steel Forgings

Dominion Foundries & Steel, Ltd., Hamilton, Ont.

## Steel, Shafting and Free Cutting

Screw  
Barnes Co., Wallace, Bristol, Conn.  
Can. Drawn Steel Co., Hamilton, Ont.  
Union Drawn Steel Co., Hamilton, Ont.

## Steel, Sheet

Dominion Foundries & Steel, Ltd., Hamilton, Ont.  
Firth & Sons, Ltd., Thos., Montreal, Q.  
Ontario Metal Products Co., Ltd., Toronto, Ont.  
Rice Lewis & Son, Ltd., Hamilton, Ont.  
Toronto Iron Works, Toronto, Ont.

## Steel, Tanks

Can. John Wood Mfg. Co., Toronto, Ont.

## Steel, Stainless

Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.  
Steel Co. of Can., Ltd., Hamilton, Ont.  
Vanadium Alloys Steel, Latrobe, Pa.

## Steel Wire Rods

Steel Co. of Canada, Ltd., Hamilton, Ont.

## Steels, Alloy, Open Hearth and Electric

United Alloy Steel Corp., Canton, Ohio.

## Steels, Alloy and Carbon

Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.  
Andrews Steel Co., Newport, Ky.  
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.  
Atkins & Co., Ltd., Wm., Sheffield, Eng.  
Barnes Co., Wallace, Bristol, Conn.  
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.  
Can. Driver-Harris Co., Walkerville, Ont.

## Can. Steel Foundries, Montreal, Que.

Dom. Foundries & Steel, Hamilton, Ont.  
Firth & Sons, Ltd., Thos., Montreal, Q.  
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

## Pilot Steel & Tool Co., Montreal, Que.

Rice Lewis & Son, Ltd., Toronto, Ont.  
Steel Co. of Can., Ltd., Hamilton, Ont.  
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.  
United Alloy Steel Corp., Canton, Ohio.  
Vanadium Alloys Steel, Latrobe, Pa.  
Vulcan Crucible Steel Co., Alliquippa, Pa.

## Steels, High-Speed

Armstrong Bros. Tool Co., Chicago, Ill.  
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.  
Atkins & Co., Ltd., Wm., Sheffield, Eng.  
Baines & David, Ltd., Toronto, Ont.  
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.  
Drury Ltd., H. A., Montreal, Que.  
Firth & Sons, Ltd., Thos., Montreal, Q.  
Pilot Steel & Tool Co., Montreal, Que.  
Rice Lewis & Son, Ltd., Toronto, Ont.  
Steel Co. of Can., Ltd., Hamilton, Ont.  
Vanadium Alloys Steel, Latrobe, Pa.  
Vulcan Crucible Steel Co., Alliquippa, Pa.

## Steel, Magnet

Can. Atlas Crucible Steel Co., Toronto, Ont.  
Vanadium Alloys Steel, Latrobe, Pa.

## Steel, Structural

MacKinnon Steel Co., Sherbrooke, Que.

## Steel Tubing, Close Joint and Welded

Standard Tube & Fence Co., Ltd., Woodstock, Ont.

## Stern Frames, Cast Steel

Can. Steel Foundries, Montreal, Que.  
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

## Straightening Machinery

Bertrams Ltd., Edinburgh, Scotland.

## Studs

Galt Machine Screw Co., Galt, Ont.

## Surface Plates

Bilton Machine Co., Bridgeport, Conn.

## Swaging Machines

Atkins & Co., Inc., E. C., Indianapolis, I.

## Switches, Railway

Can. Steel Foundries, Montreal, Que.

## Switches and Switchboards

Northern Electric Co., Montreal, Que.

## Tablets, Bronze, Memorial

Tallman Brass & Metal, Ltd., Hamilton, Ont.

## Tachometers

Aikenhead Hardware Ltd., Toronto, Ont.

## Tanks, Steel

MacKinnon Steel Co., Sherbrooke, Que.

## Tanks and Pumps, Oil

Bowser, S. F. & Co., Ltd., Toronto, Can.  
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.  
Toronto Iron Works, Toronto, Ont.

## Tapers Cutting Dies

Jones & Lamson Machine Co., Springfield, Vt.

## Tap Holders

Greenfield Tap & Die Corp., Galt, Ont.  
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

## Taper Pins

Galt Machine Screw Co., Galt, Ont.  
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.  
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

## Tapes, Measuring

Chesterman & Co., Ltd., J. Sheffield, Eng.  
Starrett Co., L. S., Athol, Mass.

## Tapping Machines and Attachments

Ackworth, Ltd., John, Birmingham, Eng.  
Archibald & Co., Chas. P., Montreal, Q.  
Burke Machine Tool Co., Conneaut, Ohio.  
Geometric Tool Co., New Haven, Conn.  
Greenfield Tap & Die Corp., Galt, Ont.  
Jardine & Co., A. B., Hespeler, Ont.  
National Acme Co., Cleveland, Ohio.  
Petrie, Ltd., H. W., Toronto, Ont.  
Starrett Co., L. S., Athol, Mass.

## Taps and Dies

Ackworth, Ltd., John, Birmingham, Eng.  
Butterfield & Co., Inc., Rock Island, Que.  
Geometric Tool Co., New Haven, Conn.  
Greenfield Tap & Die Corp., Galt, Ont.  
International Machinery & Supply Co., Montreal, Que.  
Jardine & Co., A. B., Hespeler, Ont.  
Morse Twist Drill & Machine Co., New Bedford, Mass.  
National Acme Co., Cleveland, Ohio.  
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

## Taps, Collapsing

Geometric Tool Co., New Haven, Conn.  
Jardine & Co., A. B., Hespeler, Ont.  
Murphy Machine & Tool Co., Detroit, Mich.  
National Acme Co., Cleveland, Ohio.  
Victor Tool Co., Waynesboro, Pa.

## Teeth, Dredge Bucket

Kennedy & Sons, Wm., Owen Sound, Ont.

## Testing Metals and Materials

Toronto Testing Laboratory, Toronto, Ont.

## Thermometers

Bristol Co., Waterbury, Conn.

## Thread-Cutting Tools

Butterfield & Co., Inc., Rock Island, Que.  
Greenfield Tap & Die Corp., Galt, Ont.  
Jones & Lamson Machine Co., Springfield, Vermont.  
Murphy Machine & Tool Co., Detroit, Mich.  
National Acme Co., Cleveland, Ohio.  
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.  
Victor Tool Co., Waynesboro, Pa.

## Thread Cutting Machines

Jones & Lamson Machine Co., Springfield, Vermont.  
Landis Machine Co., Inc., Waynesboro, Pa.

## Threading Machines

Acme Machinery Co., Cleveland, Ohio.  
Geometric Tool Co., New Haven, Conn.  
Greenfield Tap & Die Corp., Galt, Ont.  
Jones & Lamson Machine Co., Springfield, Vt.  
Murphy Machine & Tool Co., Detroit, Mich.  
National Acme Co., Cleveland, Ohio.  
National Machinery Co., Tiffin, Ohio.  
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

## Thread Lead Testing Machines

Jones & Lamson Machine Co., Springfield, Vt.  
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

## Thread-Rolling Machines

Bliss Co., E. W., Brooklyn, N.Y.

## Tongs

Hepburn Ltd., John T., Toronto, Ont.

## Tool Cases

Rice Lewis & Son, Ltd., Toronto, Ont.

## Tool Holders

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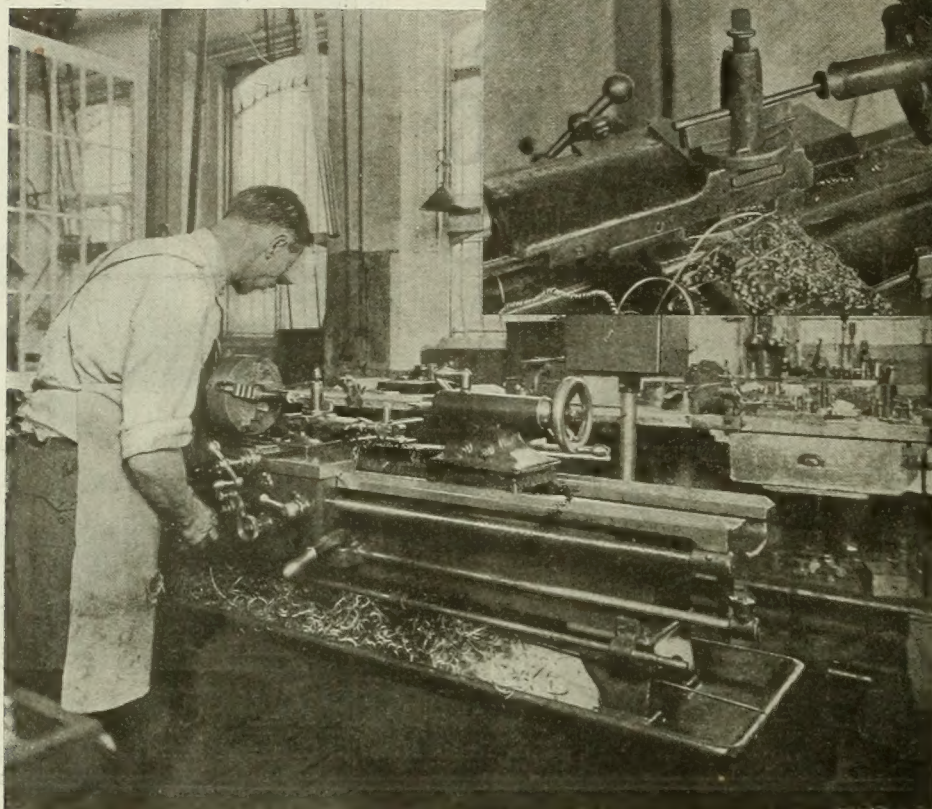
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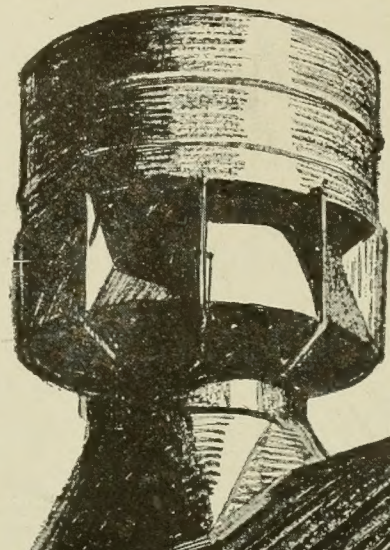
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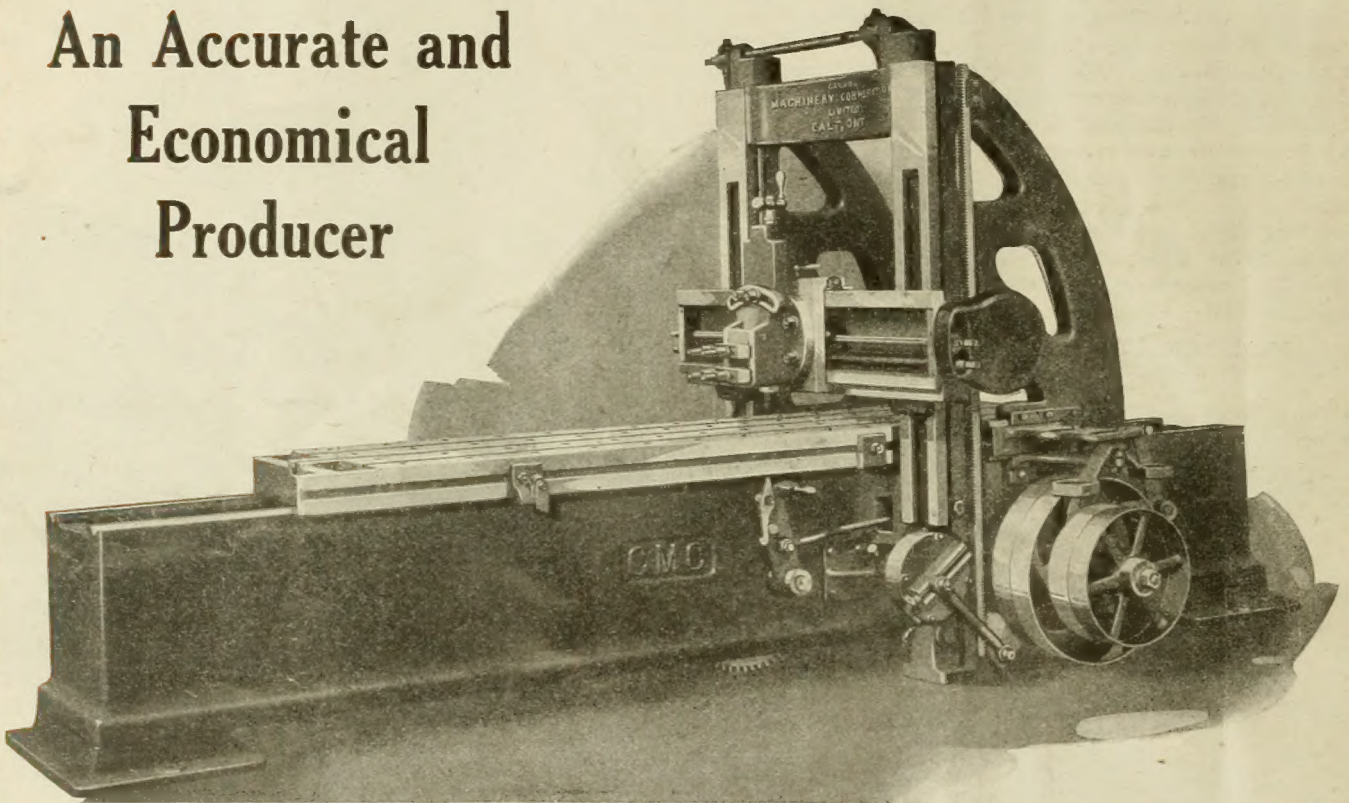




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